AD-A143 389 NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS THURSTON POND DAM CT..(U) CORPS OF ENGINEERS WALTHAM MA NEW ENGLAND DIV DEC 80 1/1

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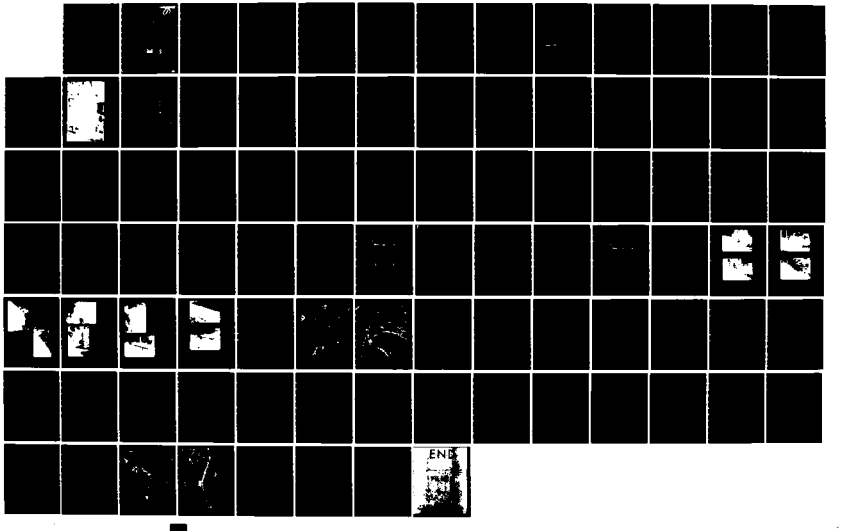

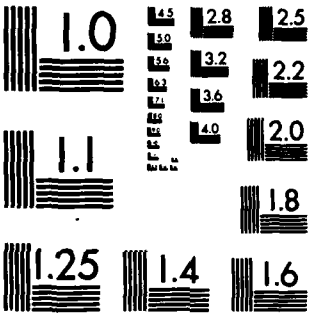

NAUGATUCK RIVER BASIN

NAUGATUCK, CONNECTICUT

THURSTON POND DAM
CT 00129

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS. 02154

DECEMBER 1980

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

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19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

DAMS, INSPECTION, DAM SAFETY,

Naugatuck River Basin
Naugatuck, Conn.
Thurston Pond Dam

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The Thurston Pond Dam, also known as the New Dam, consists of an earth embankment with a stone masonry overflow spillway located at the right end of the dam, and outlet works located at the right abutment. The total length of the dam, including the spillway section, is 510 ft. and the maximum height is 20 ft. The dam is judged to be in poor condition.The dam is classified as small in size with a high hazard potential.

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DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02254

REPLY TO
ATTENTION OF:

NEDED-E

MAR 18 1981

Honorable William A. O'Neill
Governor of the State of Connecticut
State Capitol
Hartford, Connecticut 06115

Dear Governor O'Neill:

Inclosed is a copy of the Thurston Pond Dam (CT-00129) Phase I Inspection Report, which was prepared under the National Program for Inspection of Non-Federal Dams. The report is based upon a visual inspection, a review of past performance, and a preliminary hydrological analysis. A brief assessment is included at the beginning of the report.

The preliminary hydrologic analysis has indicated that the spillway capacity for the Thurston Pond Dam would likely be exceeded by floods greater than 18 percent of the Probable Maximum Flood (PMF). Our screening criteria specifies that a dam of this class which does not have sufficient spillway capacity to discharge fifty percent of the PMF, should be adjudged as having a seriously inadequate spillway and the dam assessed as unsafe, non-emergency, until more detailed studies prove otherwise or corrective measures are completed.

The term "unsafe" applied to a dam because of an inadequate spillway does not indicate the same degree of emergency as that term would if applied because of structural deficiency. It does indicate, however, that a severe storm may cause overtopping and possible failure of the dam, with significant damage and potential loss of life downstream.

It is recommended that within twelve months from the date of this report the owner of the dam engage the services of a professional or consulting engineer to determine by more sophisticated methods and procedures the magnitude of the spillway deficiency. Based on this determination, appropriate remedial mitigating measures should be designed and completed within 24 months of this date of notification. In the interim a detailed emergency operation plan and warning system should be promptly developed. During periods of unusually heavy precipitation, round-the-clock surveillance should be provided.

MAR 18 1981

NEDED-E
Honorable William A. O'Neill

I have approved the report and support the findings and recommendations described in Section 7, with qualifications as noted above. I request that you keep me informed of the actions taken to implement these recommendations since this follow-up is an important part of the non-Federal Dam Inspection Program.

A copy of this report has been forwarded to the Department of Environmental Protection, the cooperating agency for the State of Connecticut. This report has also been furnished to the owner of the project, UniRoyal, Inc., Chemical Division, Naugatuck, CT.

Copies of this report will be made available to the public, upon request to this office, under the Freedom of Information Act, thirty days from the date of this letter.

I wish to take this opportunity to thank you and the Department of Environmental Protection for the cooperation extended in carrying out this program.

Sincerely,

C.E. EDGAR, III
Colonel, Corps of Engineers
Division Engineer

THURSTON POND DAM
CT 00129

NAUGATUCK RIVER BASIN
NAUGATUCK, CONNECTICUT

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

49-022

12/80

NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT

IDENTIFICATION NO: CT 00129

NAME OF DAM: Thurston Pond Dam

TOWN: Borough of Naugatuck

COUNTY AND STATE: New Haven County, Connecticut

STREAM: Long Meadow Pond Brook

DATE OF INSPECTION: October 14, 1980

BRIEF ASSESSMENT

The Thurston Pond Dam, also known as the New Dam, consists of an earth embankment with a stone masonry overflow spillway located at the right end of the dam, and outlet works located at the right abutment. The total length of the dam, including the spillway section, is 510 feet and the maximum height is 20 feet. The earth embankment has a top width of 8 feet, an upstream slope of 2 horizontal to 1 vertical, and a downstream slope of 1.5 horizontal to 1 vertical. The stone masonry overflow spillway section has an upstream earth embankment of unknown section, a concrete cap and a batter of 6 inches per vertical foot on the downstream face. The outlet works consist of a concrete intake structure with inlet and outlet gates which can discharge water through a 24-inch concrete pipe to downstream locations or through an 18-inch concrete pipe into the stream below the dam.

The dam impounds Thurston Pond, which is used for industrial water supply.

Based on the visual inspection, the dam is judged to be in poor condition. Features that could affect the future integrity of the

dam are continued erosion of the earth embankment, the presence of trees on the dam, the deterioration of the stone masonry overflow spillway, and inadequate spillway capacity to pass the Test Flood outflow.

The dam is classified as "Small" in size, with a "High" hazard potential. A Test Flood equal to one-half the Probable Maximum Flood (1/2 PMF) was selected in accordance with the Corps of Engineers' Recommended Guidelines for Safety Inspection of Dams. Due to the small size of the impoundment, the Test Flood outflow was assumed to equal the Test Flood inflow and would overtop the earth embankment by 1.7 feet.

The spillway capacity is 2,500 cfs or 37 percent of the Test Flood outflow.

It is recommended that a qualified, registered engineer be retained to investigate the condition and stability of the spillway and training walls; to perform a detailed hydrologic and hydraulic analysis; to oversee the tree removal and reshaping of crest and slopes; to design erosion protection for the crest and slopes; and to investigate the need for an upstream gate on the industrial water supply pipeline. In addition, a program of annual technical inspections should be instituted, a formal operations and maintenance manual should be prepared and a formal warning system should be put into effect.

The owner should implement these recommendations as described herein and in greater detail in Section 7 of the Report within one year of receipt of this Phase I Inspection Report.

Ronald G. Litke
Project Engineer

Roald Haestad
President

This Phase I Inspection Report on Thurston Pond Dam (CT-00129) has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgement and practice, and is hereby submitted for approval.

CARNEY M. TERZIAN, MEMBER
Design Branch
Engineering Division

JOSEPH W. FINEGAN, JR., MEMBER
Water Control Branch
Engineering Division

ARAMAST MAHTESIAN, CHAIRMAN
Geotechnical Engineering Branch
Engineering Division

APPROVAL RECOMMENDED:

JOE B. FRYAR
Chief, Engineering Division

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I Investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the

condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I Inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test Flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

The Phase I Investigation does not include an assessment of the need for fences, gates, no-trespassing signs, repairs to existing fences and railings and other items which may be needed to minimize trespass and provide greater security for the facility and safety of the public. An evaluation of the project for compliance with OSHA rules and regulations is also excluded.

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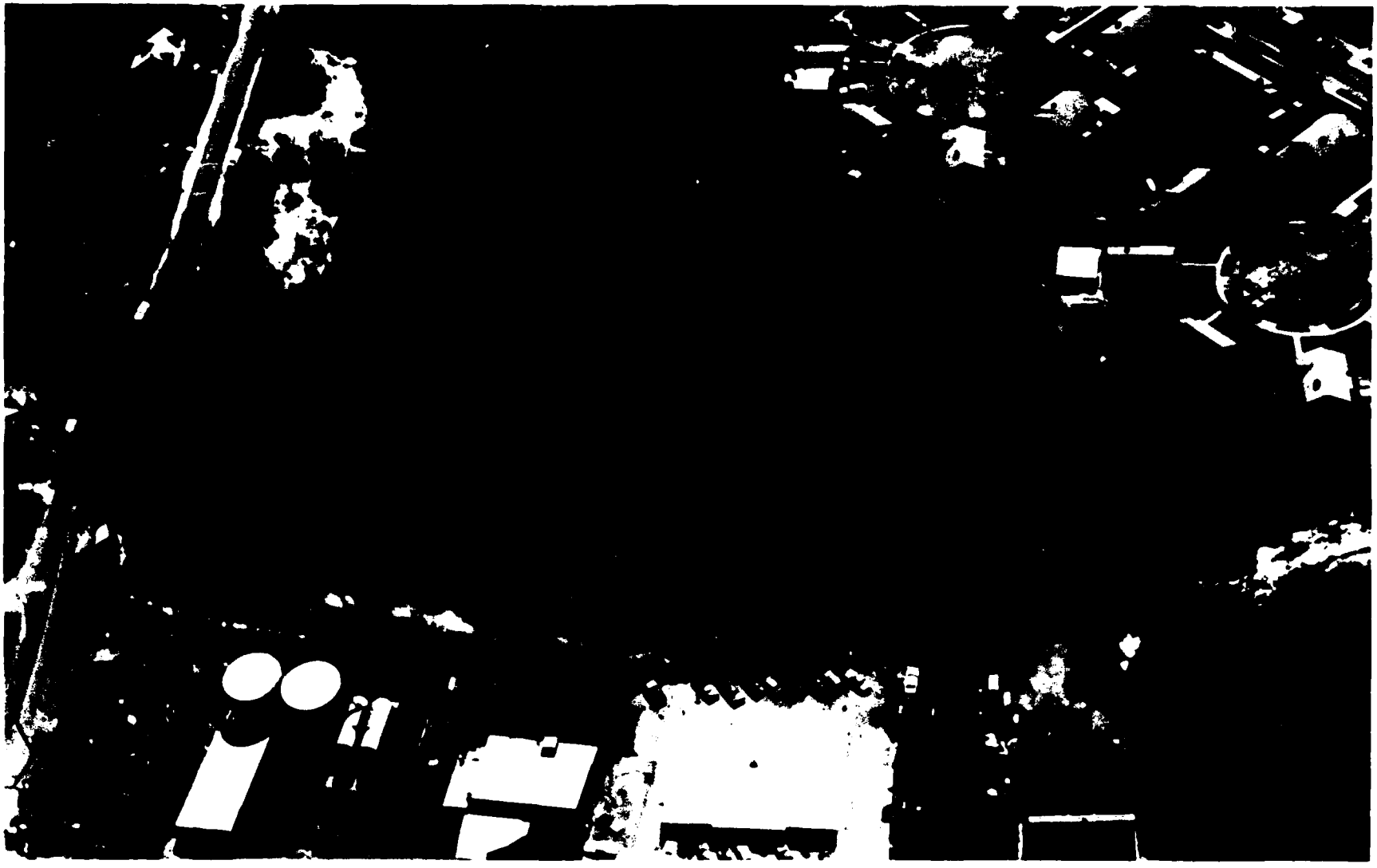
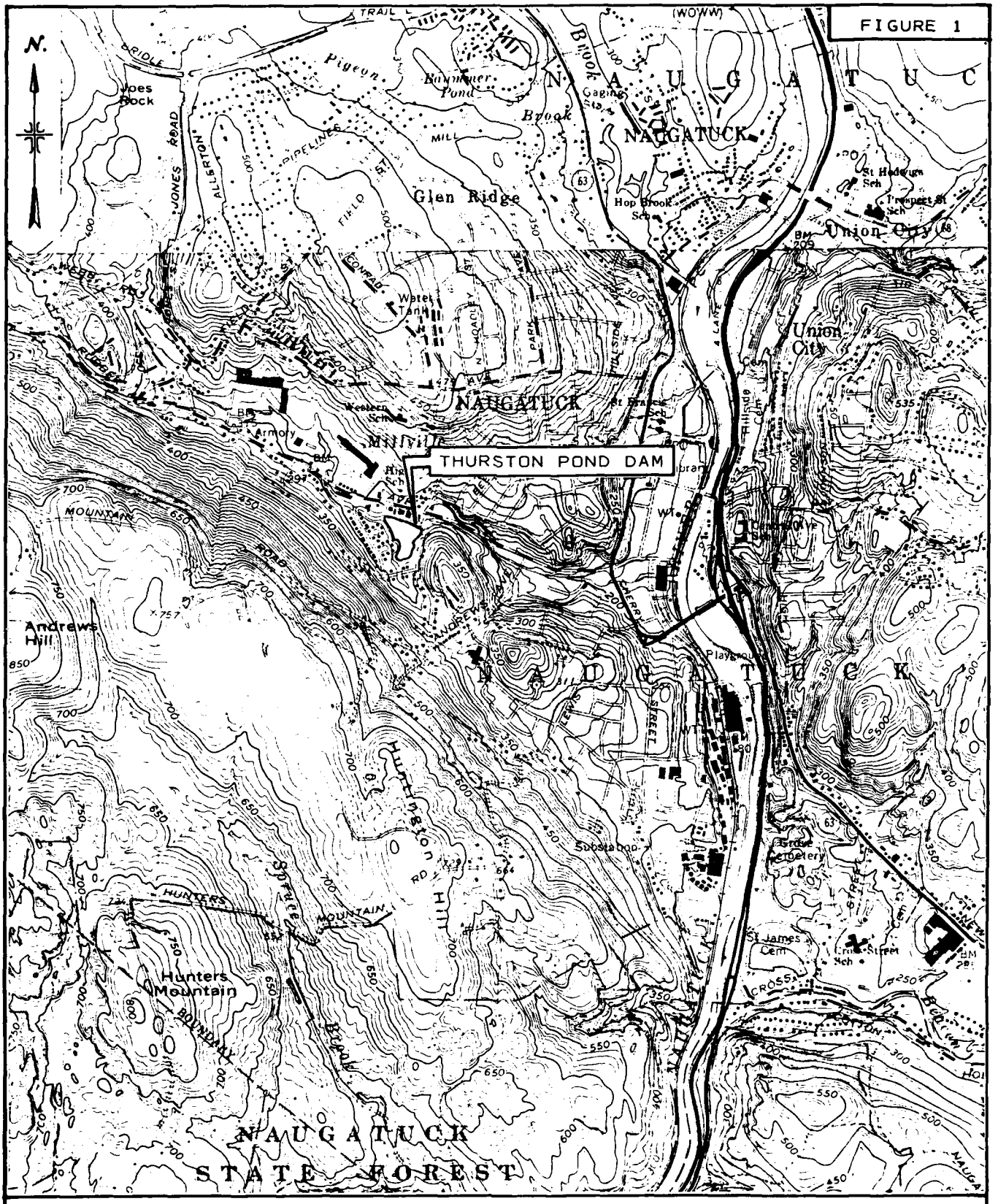


OVERVIEW PHOTO

U.S.ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASSACHUSETTS	NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	THURSTON POND DAM - CT 00129
ROALD HAESTAD, INC. CONSULTING ENGINEERS WATERBURY, CONNECTICUT		LONG MEADOW POND BROOK
		NAUGATUCK, CONNECTICUT 19 APRIL 1980



LOCATION PLAN

THURSTON POND DAM
NAUGATUCK, CONNECTICUT

SCALE: 1" = 2000'

ROALD HAESTAD, INC. NAUGATUCK QUADRANGLE 1972

NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT

THURSTON POND DAM

PROJECT INFORMATION
SECTION 1

1.1 General

a. Authority

Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a National Program of Dam Inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. Roald Haestad, Inc., has been retained by the New England Division to inspect and report on selected dams in the State of Connecticut. Authorization and notice to proceed were issued to Roald Haestad, Inc., under a letter of April 14, 1980, from William E. Hodgson, Jr., Colonel, Corps of Engineers. Contract No. DACW33-80-C-0048 has been assigned by the Corps of Engineers for this work.

b. Purpose of Inspection

The purposes of the program are to:

1. Perform technical inspection and evaluation of non-federal dams to identify conditions requiring correction in a timely manner by non-federal interest.
2. Encourage and prepare the States to quickly initiate effective dam inspection programs for non-federal dams.
3. To update, verify and complete the National Inventory of Dams.

1.2 Description of Project

a. Location

The Thurston Pond Dam, also known as the New Dam, is located on Long Meadow Pond Brook, a tributary of the Naugatuck River, approximately 200 feet south of Rubber Avenue in Naugatuck, Connecticut. The dam is shown on the Naugatuck Quadrangle map having coordinates of latitude N 41°29.3' and longitude W 73° 04.2'.

b. Description of Dam and Appurtenances

The dam consists of an earth embankment with a stone masonry overflow spillway located at the right end of the dam, and outlet works located at the right abutment. The total length of the dam, including the spillway section, is 510 feet and the maximum height is 20 feet.

The earth embankment section has a top width of 8 feet, an upstream slope of 2 horizontal to 1 vertical, and a downstream slope of 1.5 horizontal to 1 vertical. The elevation of the top of the dam varies from 278 - 280, with the average being 278.5. There is no formal slope protection present on the slopes of the dam. At the right end of the earth embankment there are two concrete walls which abut against the downstream slope of the dam. These walls form a retention basin for oil storage tanks located downstream of the dam. At about the center of the earth embankment there are two steel pipes (4-inch and 6-inch diameter) through the dam which were former intakes to a downstream ice house. The pipes pass through the dam approximately 3 feet above spillway level and are no longer in use.

The 122 foot long stone masonry overflow spillway section has an upstream earth embankment of unknown section, a maximum height

of 17 feet, and a batter on the downstream face of 6 inches per vertical foot. The dry stone masonry section has a 4 foot wide by 1.5 foot deep concrete cap, and appears to have been constructed on logs both perpendicular and parallel to the dam. There are stone masonry training walls to the left and right of the overflow section. The dam crest is 3.5 feet above spillway level, and the area at the outlet works is 2.2 feet above spillway level.

The outlet works consist of a concrete intake structure located at the right abutment. Water flows into the chamber through a wooden trash rack and a 3.5 foot wide by 3.5 foot high sluice gate and then discharges through a 24-inch concrete pipe to a downstream location where it is used for industrial purposes. There is no upstream gate on the 24-inch pipe at the intake structure and no known blowoffs on the pipeline. There is an 18- inch drain gate in the chamber which discharges through an 18-inch concrete pipe that outlets at the end of the right spillway training wall. The chamber also contains an overflow which discharges over the top of the right spillway training wall. The intake structure and gates serve as the low level outlet for the dam.

c. Size Classification - "Small"

According to the Corps of Engineers' Recommended Guidelines for Safety Inspection of Dams, a dam is classified as "Small" in size if the height is between 25 feet and 40 feet, or the dam impounds between 50 Acre-Feet and 1,000 Acre-Feet. Not included in the inspection program are dams which are 6 feet or less in height, regardless of storage capacity, or which have a storage capacity of 15 Acre-Feet or less, regardless of height. The dam has a maximum height of 20 feet and a maximum storage capacity of 45 Acre-Feet.

For the purpose of this report, the dam was classified as "Small".

d. Hazard Classification - "High"

Based on the Corps of Engineers' Recommended Guidelines for Safety Inspection of Dams, the hazard classification for the dam is "High". A dam failure could result in the loss of more than a few lives and extensive property damage. A dam failure analysis indicates that a breach of Thurston Pond Dam would overtop Rubber Avenue by approximately 8 feet, flooding commercial structures to a depth of approximately 6 feet above floor level. The flood waters would continue downstream, overtopping several streets by up to 7 feet. Downstream of Andrew Avenue and Cherry Street industrial complexes would be flooded by up to 3 feet (see Figure 5, page D-25).

The maximum spillway discharge of 2,500 cfs prior to dam failure would overtop Rubber Avenue at Section 1, Arch Street and Cherry Street by up to 2 feet, but would flow back into the channel without causing serious property damage. The culvert under the industrial complex below Cherry Street can pass the spillway discharge.

e. Ownership

UniRoyal, Inc.
Chemical Division
Eric Johnson, Factory Manager
Elm Street
Naugatuck, Connecticut 06770
(203) 723-3526

f. Operator

George Arndt, Engineering Associate
UniRoyal, Inc.
Chemical Division
Elm Street
Naugatuck, Connecticut 06770
(203) 723-3526

g. Purpose of the Dam

The purpose of the dam is to supply industrial water to downstream manufacturing plants.

h. Design and Construction History

There are no records available on the original design and construction of the dam. It was reported that repairs were made to the intake gate this summer (1980) in order to repair damage caused by vandals.

i. Normal Operating Procedures

The sluice gate on the intake structure is left open to allow water to flow through a conduit to downstream manufacturing plants.

1.3 Pertinent Data

a. Drainage Area

The drainage area consists of 7.8 square miles of "rolling" wooded hills with scattered residential development, except for the section along Rubber Avenue within one mile of the dam, which has substantial commercial development.

b. Discharge at Damsite

Discharge at the damsite is over a 122 foot long overflow spillway, and through a 24-inch conduit to downstream locations. An 18-inch drain discharges downstream of the spillway section.

1.	Outlet Works (conduits) Size:	18-inches	24-inches
	Invert Elevation:	270.7	270±
	Discharge Capacity:	27 cfs with pool @ El. 278.5	6 cfs with pool @ El. 275
2.	Maximum Known Flood at Damsite:	N/A	
3.	Ungated Spillway Capacity at Top of Dam:	2,400 cfs	
	Elevation:	278.5	
4.	Ungated Spillway Capacity at Test Flood Elevation:	4,340 cfs	
	Elevation:	280.2	
5.	Gated Spillway Capacity at Normal Pool Elevation:	N/A	
	Elevation:		
6.	Gated Spillway Capacity at Test Flood Elevation:	N/A	
	Elevation:		
7.	Total Spillway Capacity at Test Flood Elevation:	4,340 cfs	
	Elevation:	280.2	
8.	Total Project Discharge at Top of Dam:	2,500 cfs*	
	Elevation:	278.5	
9.	Total Project Discharge at Test Flood Elevation:	6,730 cfs	
	Elevation:	280.2	

*Includes discharge over 24 foot long area at outlet works which is 1.3 feet lower than the top of the dam.

c. Elevation - Feet Above Mean Sea Level (NGVD)

1.	Streambed at Toe of Dam:	258.5
2.	Bottom of Cutoff:	Unknown
3.	Maximum Tailwater:	N/A
4.	Normal Pool:	275.0
5.	Full Flood Control Pool:	N/A
6.	Spillway Crest:	275.0
7.	Design Surcharge - Original Design:	Unknown
8.	Top of Dam:	278.5 (Varies 278 - 280)
9.	Test Flood Surcharge:	280.2

d. Reservoir - Length in Feet

1.	Normal Pool:	600 feet
2.	Flood Control Pool:	N/A
3.	Spillway Crest Pool:	600 feet
4.	Top of Dam:	800 feet
5.	Test Flood Pool:	1,000 feet

e. Storage - Acre-feet

1.	Normal Pool:	29 Acre-Feet
2.	Flood Control Pool:	N/A
3.	Spillway Crest Pool:	29 Acre-Feet
4.	Top of Dam:	45 Acre-Feet
5.	Test Flood Pool:	69 Acre-Feet

f. Reservoir Surface - Acres

1.	Normal Pool:	3.7 Acres
2.	Flood-Control Pool:	N/A
3.	Spillway Crest:	3.7 Acres
4.	Test Flood Pool:	6.6 Acres
5.	Top of Dam:	5.6 Acres

g. Dam

1.	Type:	Earth Embankment
2.	Length:	510 feet (including spillway and outlet works)
3.	Height:	20 feet
4.	Top Width:	8 feet
5.	Side Slopes:	2 Horizontal to 1 Vertical Upstream 1.5 Horizontal to 1 Vertical Downstream
6.	Zoning:	Unknown
7.	Impervious Core:	Unknown
8.	Cutoff:	Unknown
9.	Grout Curtain:	N/A
10.	Other:	

h. Diversion and Regulating Tunnel N/A

i. Spillway

1.	Type:	Stone Masonry Overflow with Concrete Cap
2.	Length of Weir:	122 feet
3.	Crest Elevation with Flash Boards: without Flash Boards:	 N/A 275.0
4.	Gates:	N/A
5.	Upstream Channel:	N/A
6.	Downstream Channel:	Natural Stream
7.	General:	3.5 feet from spillway crest to top of earth embankment; 2.2 feet from spillway crest to top of wall at outlet works.

j. Regulating Outlets

1.	Invert:	270± at 3.5 foot by 3.5 foot intake gate 270.7 at outlet of 18-inch drain
2.	Size:	24-inch, 18-inch
3.	Description:	24-inch concrete pipe - industrial water supply 18-inch concrete pipe - drain
4.	Control Mechanism:	Manually operated sluice gates
5.	Other:	

ENGINEERING DATA
SECTION 2

2.1 Design Data

There was no design data available for review on either the dam or the spillway.

2.2 Construction Data

There was no construction data available for review on either the dam or the spillway. It was reported that repairs were made to the intake gate this summer (1980) in order to repair damage caused by vandals.

2.3 Operation Data

There was no operation data available for review. A report entitled "Engineering Report to UniRoyal, Inc., Chemical Division, Naugatuck, Connecticut, on Surface Water Availability, Character and Treatment, Phase I" by I. Laird Newell, P.E., Consulting Engineer, dated 3/10/80, was available and reviewed.

2.4 Evaluation of Data

a. Availability

Design or construction data was not available from either the State of Connecticut Department of Environmental Protection or UniRoyal, Inc., the owner of the dam.

b. Adequacy

As no design or construction information was available, the assessment of the condition of the dam was based on the visual inspection, past performance history, and hydrologic and hydraulic calculations performed for this report.

VISUAL INSPECTION

SECTION 3

3.1 Findings

a. General

The visual inspection of the dam was conducted on October 14, 1980. At the time of inspection the water level was slightly below spillway elevation.

The dam consists of an earth embankment with a stone masonry overflow spillway located at the right end of the dam, Photo 1, and outlet works located to the right of the spillway.

b. Dam

The earth embankment portion of the dam has a length of approximately 350 feet. The upstream and downstream slopes are covered with bushes and trees with trunk diameters up to 1 foot, Photos 2 and 3. The upstream slope has no observable riprap or any other type of slope protection. The crest is very irregular as a result of erosion, with the exposed soil consisting of a silty, gravelly sand. Field surveys performed for this investigation indicate differences in elevation along the crest of approximately 2.5 feet. The downstream slope is relatively steep, about 1.5 horizontal to 1 vertical. A foot path for access to the crest has caused substantial erosion of the downstream slope, Photo 4. No seepage was observed on the downstream slope. A wet area with standing water was noted downstream of the dam. It is not certain whether the water originated from seepage through the dam or from surface runoff from a paved parking area immediately to the left and at a higher elevation than the wet area. The presence of

rust-colored floccules in the water indicate that at least some of the water is probably the result of seepage. Two steel pipes, 4-inch and 6-inch in diameter, have been used in the past to draw water from the reservoir. The pipes located approximately 160 feet left of the spillway extend through the dam above the normal water level in the pond. Upstream the 6-inch pipe is supported above the water by a partially collapsed wooden pier. At the end of the pier the pipe extends down into the water. The 4-inch pipe extends straight out of the embankment approximately 10 feet upstream and ends above the normal waterline. Downstream of the dam both pipes are laid above the ground and extend to an ice house approximately 75 feet below the dam. Approximately 140 feet to the left of the spillway there is a steel stairway on the downstream slope of the dam.

c. Appurtenant Structures

The spillway consists of a dry stone masonry wall with an upstream earth embankment. There are large voids present on the downstream face, particularly in the lower half, Photo 5. It appears that some bulging of the lower part of the wall may have occurred in the past. Seepage on the order of 2 gpm is exiting out of the wall at various elevations, Photo 5. The seepage water appeared to be clear at the time of inspection. At the base of the spillway logs which are perpendicular to the axis of the dam extend approximately 8 - 10 feet downstream, Photo 6. Logs which are parallel to the axis are also present. It appears that the stone wall was built over the logs. The logs may have been a base for the stone masonry wall or may have been installed to prevent scour at the base of the wall. A concrete cap at the crest of the spillway is in apparent good condition, Photo 6. There is an irregular opening in the stone masonry of about 3 feet

by 1.5 feet at the right end of the spillway face which may be an old outlet plugged at the upstream face, Photo 7. The left training wall downstream of the spillway is a stone masonry wall with occasional large voids, Photo 8, and some indications of deformation due to settlement. The right training wall downstream of the spillway is also stone masonry and shows some deterioration in its upper part, probably due to flow over the wall from the intake structure overflow. There is a stone masonry training wall upstream of the right end of the spillway, with large openings and bushes growing between the stone blocks. This area is approximately 1.3 feet lower than the earth embankment portion of the dam.

The outlet works consist of a concrete intake structure located at the right abutment. The exposed part of the concrete structure appears to be in good condition, Photos 10 and 11. The intake sluice gate is in good condition and is reported to be operable. A wooden trash rack in front of the sluice gate is rotted at the water line. The intake sluice gate controls the flow into the structure and into a pipeline which supplies water to downstream locations where it is used for industrial purposes. An 18-inch concrete pipe discharges through the upper part of the right spillway training wall, Photo 9. The flow through this pipe is controlled by a sluice gate located outside the intake structure, Photo 11. The gate was reported to be operable. The intake structure and gate serve as the low level outlet for the dam. There is an overflow for the intake structure which discharges over the right spillway training wall. There are indications of erosion in front of the training wall, probably resulting from the discharge of the overflow and the 18-inch pipe.

d. Reservoir Area

Evidence of siltation of the reservoir could be observed. See Overview Photo, page x.

No indications of slope instability could be observed along the edges of the reservoir in the vicinity of the dam.

e. Downstream Channel

The downstream channel is the natural streambed, Photo 12. A bridge for Rubber Avenue crosses over the stream about 200 feet downstream from the dam. Upstream of the bridge there is a one story building on the right bank and oil storage tanks on the left bank.

There is some brush growing in the stream channel, but it does not constitute a significant obstruction to flow.

3.2 Evaluation

The visual inspection indicates the dam to be in poor condition because of the following:

1. The continuing erosion of the crest of the dam can lead to overtopping in the eroded areas.
2. The extensive growth of trees on the upstream and downstream slopes of the dam can contribute to a breach of the dam if the trees are overturned during storms or piping if the roots rot after the death of the trees.
3. The two pipes through the top of the earth embankment could provide seepage paths during periods of high flow.
4. The logs that exist at the base of the spillway structure can, upon deterioration, cause a failure of the spillway. The present poor condition of the lower part of the stone wall of the spillway may be due to deterioration of the logs under the spillway.

5. The poor condition of the spillway training walls can lead to breaching around the ends of the spillway.
6. Continued deterioration of the wooden trash rack at the intake sluice gate could allow debris or portions of the rack itself to clog the gate.
7. The lack of an upstream gate or other means to relieve the pressure on the industrial water supply pipeline could lead to internal erosion or piping around the pipeline in the vicinity of the dam.
8. The presence of silt in the impoundment could cause excess pressure on the upstream face of the spillway.

OPERATIONAL AND MAINTENANCE PROCEDURES

SECTION 4

4.1 Operational Procedures

a. General

The sluice gate on the intake structure is left open to allow water to flow through a 24-inch concrete pipe to downstream locations where water is used for industrial purposes.

b. Description of Any Warning System in Effect

There is no warning system in effect for the dam.

4.2 Maintenance Procedures

a. General

There are no formal maintenance procedures for the dam.

b. Operating Facilities

Work was performed on the intake gate this summer (1980) to repair damage caused by vandals. Gates are maintained as required.

4.3 Evaluation

Present operations and maintenance procedures are inadequate, as is evident by the overall condition of the dam.

An operations and maintenance manual should be prepared for the dam and operating facilities, and a formal warning system should be put into effect. In addition, the dam should be inspected annually by a qualified, registered engineer.

EVALUATION OF HYDRAULIC/HYDROLOGIC FEATURES
SECTION 5

5.1 General

The spillway at Thurston Pond Dam is a 122-foot long stone masonry overflow spillway located at the right end of the dam. The spillway consists of a concrete cap, on a stone masonry wall having a downstream batter of 6 inches per vertical foot. To the right of the spillway is a low 24 foot long section of stone masonry walls and the outlet works. The top of the dam is about 3.5 feet above spillway level and the area at the outlet works is about 2.2 feet above spillway.

The dam has a maximum height of 20 feet and a storage capacity of 45 Acre-feet with the water level at the top of the dam.

The tributary watershed area is 7.8 square miles of "rolling" wooded hills with scattered residential development, except for the section along Rubber Avenue within one mile of the dam which has substantial commercial development. The watershed elevations range from 970 feet at the northwest end to 275 feet at the dam. There are several ponds within the watershed, but only Long Meadow Pond is of significant size (Figure 4, page D-1).

5.2 Design Data

No computations were available for the design of the spillway or the dam.

5.3 Experience Data

No records of past flood experiences were available.

5.4 Test Flood Analysis

Based on the dam failure analysis, the dam is classified as "High" hazard potential. The dam is classified as "Small" in size based on a height of 20 feet and storage capacity of 45 Acre-Feet, both of which are below minimum requirements for that size classification. According to the Recommended Guidelines for Safety Inspection of Dams, by the Corps of Engineers, the Test Flood for a "Small" dam with a "High" hazard potential should be in the range of one-half the Probable Maximum Flood (1/2 PMF) to the Probable Maximum Flood (PMF).

A Test Flood equal to the 1/2 PMF was selected because of the low height and small storage capacity of the dam. The Test Flood was calculated using a peak inflow for the PMF of 1,725 cubic feet per second per square mile (csm) from the Guide Curves for "rolling" terrain supplied by the Corps of Engineers, and the 7.8 square mile watershed of the Thurston Pond Dam. The peak 1/2 PMF inflow was calculated to be 6,730 cfs. The outflow was assumed to equal the inflow because the dam's surcharge storage capacity is negligible.

The spillway capacity was calculated to be 2,500 cfs or 37 percent of the Test Flood outflow. The Test Flood would overtop the dam embankment by 1.7 feet.

5.5 Dam Failure Analysis

A dam failure analysis was made using the Corps of Engineers' "Rule of Thumb" Guidance. Failure was assumed when the water level reached the top of the dam, producing a maximum head of 20 feet.

The spillway discharge prior to dam breach was significant when compared to the dam breach flows; and therefore, it was taken into consideration in the flood routings. The spillway discharge was first routed through each reach assuming steady state conditions, and the

storage volume thus obtained subtracted from the storage required for the dam breach flood routing in order to derive the usable storage within the reach.

The calculated dam breach of 20 feet high by 114 feet wide would release up to 17,150 cfs into the stream below the dam. The dam breach was assumed to include the spillway and therefore the spillway discharge was not added to the dam breach flow. The flood wave would overtop Rubber Avenue, located 200 feet downstream of the dam, by approximately 8 feet. The commercial structures below the dam would be inundated to a depth of approximately 6 feet above floor level. The flood waters would continue downstream overtopping several streets by up to 7 feet. Downstream of Andrew Avenue a large industrial complex would be flooded to a depth of about 3 feet.

The peak outflow at Cherry Street Section 5 (see Figure 5, page D-25) is approximately 6,500 cfs. Downstream of Cherry Street the stream flows within 2 arched corrugated metal pipe culverts beneath a large industrial complex. The peak capacity of the 2 culverts is approximately 3,200 cfs. The flood waters would overtop the channel banks and flow overland to the Naugatuck River, flooding the industrial complex.

The maximum spillway discharge of 2,500 cfs prior to dam failure would overtop Rubber Avenue at Section 1, Arch Street and Cherry Street by up to 2 feet but would flow back into the channel without causing serious property damage. The culvert under the industrial complex below Cherry Street can pass the spillway discharge.

The dam was classified as "High" potential hazard because of the possible loss of more than a few lives and extensive downstream property damage should the dam fail.

EVALUATION OF STRUCTURAL STABILITY
SECTION 6

6.1 Visual Observations

The deterioration of the spillway base and of the spillway training walls could lead to future instability. Logs present at the base of the spillway structure can, upon deterioration, cause a failure of the spillway. Continued seepage through the stone masonry spillway wall could lead to piping of the upstream embankment.

6.2 Design and Construction Data

There was no design or construction data available for review.

6.3 Post-Construction Changes

There is no information nor visual evidence of post-construction changes.

6.4 Seismic Stability

The dam is located in Seismic Zone 1 and in accordance with the Phase I Inspection Guidelines does not warrant seismic stability analysis.

ASSESSMENT, RECOMMENDATIONS, & REMEDIAL MEASURES
SECTION 7

7.1 Dam Assessment

a. Condition

On the basis of the visual inspection, the dam is judged to be in poor condition. The future integrity of the dam could be affected by the erosion of the earth embankment and the trees growing on the embankment, the deterioration of the stone masonry spillway and training walls, and the lack of an upstream gate or other means of relieving pressure on the industrial water supply pipeline to the downstream locations.

An evaluation of the hydraulic and hydrologic features of the dam determined that the spillway is capable of passing 37 percent of the Test Flood outflow.

b. Adequacy of Information

As no design or construction data was available for review, the assessment of the condition of the dam was based on the visual inspection, past performance history, and the hydraulic and hydrologic calculations for this Report.

c. Urgency

The recommendations presented in Section 7.2 and 7.3 should be carried out by the owner within one year after receipt of this Report.

7.2 Recommendations

The following recommendations should be carried out under the direction of a qualified, registered engineer:

1. All trees including stumps and root systems should be removed from the dam and to within 20 feet from the toe. The 4-inch

and 6-inch diameter steel pipes which pass through the upper portion of the embankment should be removed. The holes should be backfilled and thoroughly compacted with materials to be specified by the engineer.

2. Reshape crest and slopes as needed and provide surface erosion protection with riprap on the upstream slope, gravel or sod on the crest, and sod or riprap on the downstream slope.
3. Investigate the condition and stability of the spillway and training walls and design and construct modifications to insure stability.
4. Investigate the need for an upstream gate or other means to relieve pressure on the pipeline from the dam to the downstream locations.
5. Perform a detailed hydrologic and hydraulic analysis in order to determine the need for and means to provide additional project discharge capacity.

7.3 Remedial Measures

a. Operation and Maintenance Procedures

1. Remove periodically all brush from the dam and within 20 feet from the toe.
2. Repair or replace the wooden trash rack at the intake gate.
3. Institute a program of annual technical inspections by qualified, registered engineers.
4. Prepare a formal operations and maintenance manual for the dam and operating facilities.
5. Develop a downstream warning system in case of an emergency at the dam.

7.4 Alternatives

There are no practical alternatives to the recommendations described herein.

APPENDIX A

VISUAL CHECK LIST WITH COMMENTS

VISUAL INSPECTION CHECK LIST
PARTY ORGANIZATION

PROJECT: Thurston Pond Dam

DATE: October 14, 1980 TIME: 10:30 am WEATHER: Sunny 55°

W.S. ELEVATION: 274.9 U.S. N/A DN.S
0.1' below spillway

	PARTY	DISCIPLINE
1.	Donald L. Smith, P.E. - Roald Haestad, Inc.	Civil/Hydrologist
2.	Ronald G. Litke, P.E. - Roald Haestad, Inc.	Civil/Structural
3.	Gonzalo Castro, PhD, P.E. - Geotechnical Engineers, Inc.	Geotechnical
4.		
5.		
6.		

	PROJECT FEATURE	INSPECTED BY	REMARKS
1.	Dam Embankment	DLS,RGL,GC	Crest and slopes eroded. Heavy tree & brush growth.
2.	Outlet Works - Intake Channel and Structure	DLS,RGL,GC	No channel, structure fair.
3.	Outlet Works - Control Tower	DLS,RGL	Good condition
4.	Outlet Works - Transition & Conduit	DLS,RGL	Outlet 18" Concrete Pipe. Supply 24" Concrete Pipe.
5.	Outlet Works - Outlet Structure & Channel	DLS,RGL,GC	Pipe discharges through spillway training wall.
6.	Outlet Works - Spill. Weir,Appr. & Dis. Channel	DLS,RGL,GC	Training walls poor. Voids & seepage at spillway.
7.			
8.			
9.			
10.			
11.			
12.			

PERIODIC INSPECTION CHECK LIST

PROJECT: Thurston Pond Dam DATE: 10/14/80

PROJECT FEATURE: Dam Embankment NAME: DLS, RGL

DISCIPLINE: Civil and Geotechnical Engineers NAME: GC

AREA ELEVATION	CONDITIONS
DAM EMBANKMENT	
CREST ELEVATION	275.0
CURRENT POOL ELEVATION	274.9
MAXIMUM IMPOUNDMENT TO DATE	Unknown
SURFACE CRACKS	None observed
PAVEMENT CONDITION	Not applicable
MOVEMENT OR SETTLEMENT OF CREST	None observed. Crest badly eroded.
LATERAL MOVEMENT	Too irregular to judge
VERTICAL ALIGNMENT	Too irregular to judge
HORIZONTAL ALIGNMENT	Too irregular to judge
CONDITION AT ABUTMENT AND AT CONCRETE STRUCTURES	Good
INDICATIONS OF MOVEMENT OF STRUCTURAL ITEMS ON SLOPES	Not applicable
TRESPASSING ON SLOPES	Several footpaths
VEGETATION ON SLOPES	Heavy tree and brush cover.
SLOUGHING OR EROSION OF SLOPES OR ABUTMENTS	Erosion on slopes, particularly at footpaths
ROCK SLOPE PROTECTION - RIPRAP FAILURES	No riprap observed.
UNUSUAL MOVEMENT OR CRACKING AT OR NEAR TOES	None observed
EMBANKMENT OR DOWNSTREAM SEEPAGE	Possibly some seepage downstream of the dam.
PIPING OR BOILS	None observed
FOUNDATION DRAINAGE FEATURES	None known.
TOE DRAINS	None known
INSTRUMENTATION SYSTEM	None known

PERIODIC INSPECTION CHECK LIST

PROJECT: Thurston Pond Dam DATE: 10/14/80

PROJECT FEATURE: Outlet Works - Intake Channel and Structure NAME: DLS,RGL

DISCIPLINE: Civil and Geotechnical Engineers NAME: GC

AREA EVALUATED	CONDITIONS
OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE	
A. APPROACH CHANNEL:	Not observable, under water
SLOPE CONDITIONS	
BOTTOM CONDITIONS	
ROCK SLIDES OR FALLS	
LOG BOOM	
DEBRIS	
CONDITION OF CONCRETE LINING	
DRAINS OR WEEP HOLES	
B. INTAKE STRUCTURE:	
CONDITION OF CONCRETE	Fair
STOP LOGS AND SLOTS	

OTHER: Wooden trash rack intake rotted at water line.

PERIODIC INSPECTION CHECK LIST

PROJECT: Thurston Pond Dam DATE: 10/14/80

PROJECT FEATURE: Outlet Works - Control Tower NAME: DLS

DISCIPLINE: Civil Engineers NAME: RGL

AREA EVALUATED	CONDITIONS
OUTLET WORKS - CONTROL TOWER	
A. CONCRETE AND STRUCTURAL:	Gates are located at intake structure.
GENERAL CONDITION	Good
CONDITION OF JOINTS	No joints observed
SPALLING	None observed
VISIBLE REINFORCING	None observed
RUSTING OR STAINING OF CONCRETE	Rust stains from railing
ANY SEEPAGE OR EFFLORESCENCE	None observed
JOINT ALIGNMENT	No joints observed
UNUSUAL SEEPAGE OR LEAKS IN GATE CHAMBER	N/A
CRACKS	None observed
RUSTING OR CORROSION OF STEEL	Steel mesh corroded near outlet gate
B. MECHANICAL AND ELECTRICAL:	
AIR VENTS	N/A
FLOAT WELLS	N/A
CRANE HOIST	N/A
ELEVATOR	N/A
HYDRAULIC SYSTEM	N/A
SERVICE GATES	Gates appeared good, reported operable.
EMERGENCY GATES	N/A
LIGHTNING PROTECTION SYSTEM	N/A
EMERGENCY POWER SYSTEM	N/A
WIRING AND LIGHTING SYSTEM IN GATE CHAMBER	N/A

PERIODIC INSPECTION CHECK LIST

PROJECT: Thurston Pond Dam DATE: 10/14/80

PROJECT FEATURE: Outlet Works - Transition & Conduit NAME: DLS

DISCIPLINE: Civil Engineers NAME: RGL

AREA EVALUATED	CONDITIONS
OUTLET WORKS - TRANSITION AND CONDUIT	Conduit for outlet consists of 18" concrete pipe. Conduit for downstream industrial water supply consists of 24" concrete pipe.
GENERAL CONDITION OF CONCRETE	
RUST OR STAINING ON CONCRETE	
SPALLING	
EROSION OR CAVITATION	
CRACKING	
ALIGNMENT OF MONOLITHS	
ALIGNMENT OF JOINTS	
NUMBERING OF MONOLITHS	

PERIODIC INSPECTION CHECK LIST

PROJECT: Thurston Pond Dam DATE: 11/14/80

PROJECT FEATURE: Outlet Works - Outlet Structure and Outlet Channel NAME: RGL,DLS

DISCIPLINE: Civil and Geotechnical Engineers NAME: GC

AREA EVALUATED	CONDITIONS
OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL GENERAL CONDITION OF CONCRETE	Outlet structure is 18" concrete pipe discharging at right training wall.
RUST OR STAINING	N/A
SPALLING	N/A
EROSION OR CAVITATION	Some erosion at base of training wall
VISIBLE REINFORCING	N/A
ANY SEEPAGE OR EFFLORESCENCE	N/A
CONDITION AT JOINTS	N/A
DRAIN HOLES	N/A
CHANNEL	Natural stream channel
LOOSE ROCK OR TREES OVERHANGING CHANNEL	Some trees overhanging channel
CONDITION OF DISCHARGE CHANNEL	Good

PERIODIC INSPECTION CHECK LIST

PROJECT: Thurston Pond Dam DATE: 10/14/80

PROJECT FEATURE: Outlet Works - Spillway Wier, Approach & Disch. Channel NAME: DLS,RGL

DISCIPLINE: Civil Engineers NAME: GC

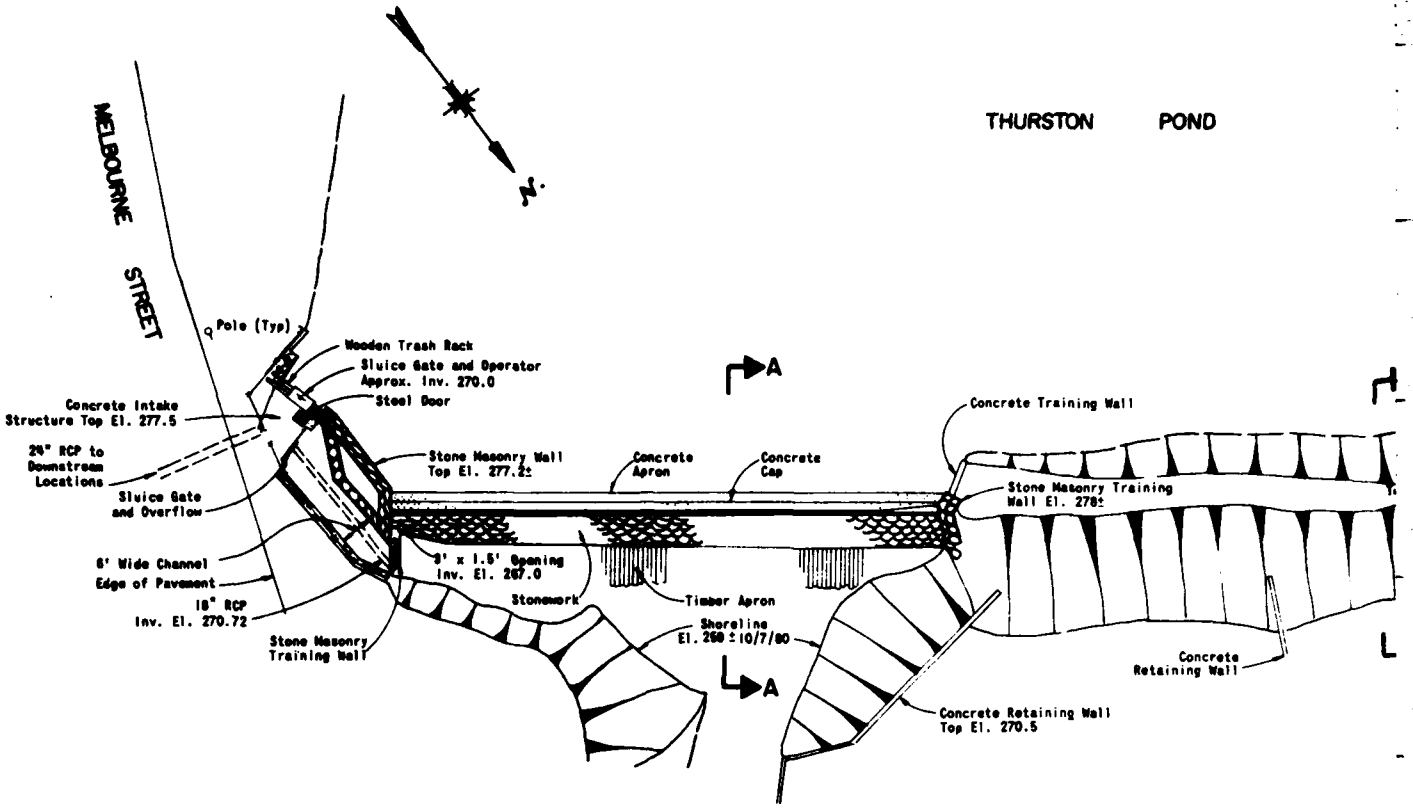
AREA EVALUATED	CONDITIONS
OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS	
A. APPROACH CHANNEL:	No approach channel
GENERAL CONDITION	
LOOSE ROCK OVERHANGING CHANNEL	
TREES OVERHANGING CHANNEL	
FLOOR OF APPROACH CHANNEL	
B. WEIR AND TRAINING WALLS:	Dry stone masonry
GENERAL CONDITION OF CONCRETE	Large voids and possible bulging of stone masonry spillway weir; training walls poor; concrete cap good.
RUST OR STAINING	N/A
SPALLING	N/A
ANY VISIBLE REINFORCING	N/A
ANY SEEPAGE OR EFFLORESCENCE	Seepage through stone masonry at several locations.
DRAIN HOLES	N/A
C. DISCHARGE CHANNEL:	Natural stream channel
GENERAL CONDITION	Good
LOOSE ROCK OVERHANGING CHANNEL	None observed
TREES OVERHANGING CHANNEL	Several trees
FLOOR OF CHANNEL	Gravel and boulders
OTHER OBSTRUCTIONS	Bridge about 200' downstream

OTHER: Longitudinal and transverse logs at base of spillway.

APPENDIX B

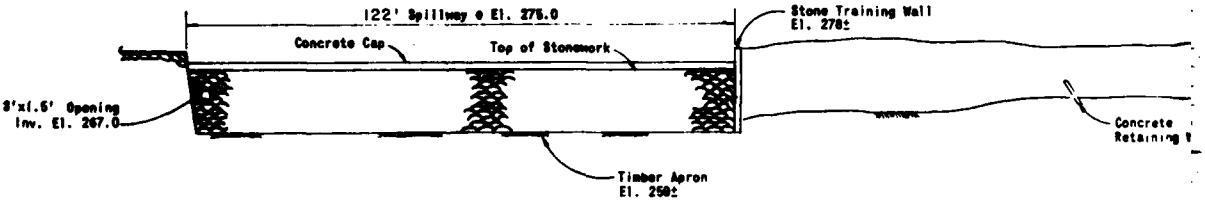
ENGINEERING DATA

THURSTON POND



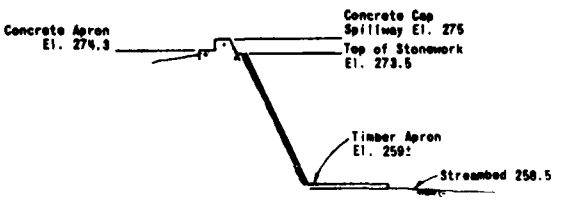
PLAN

Scale: 1" = 40'



ELEVATION

Scale: 1" = 40'
Hor. & Vert.



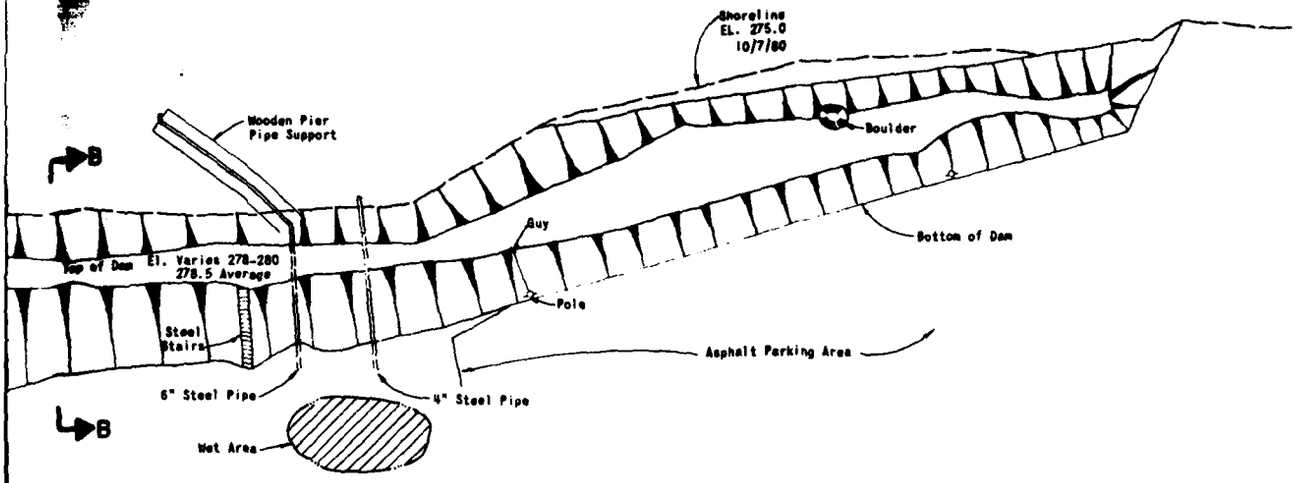
SECTION A-A

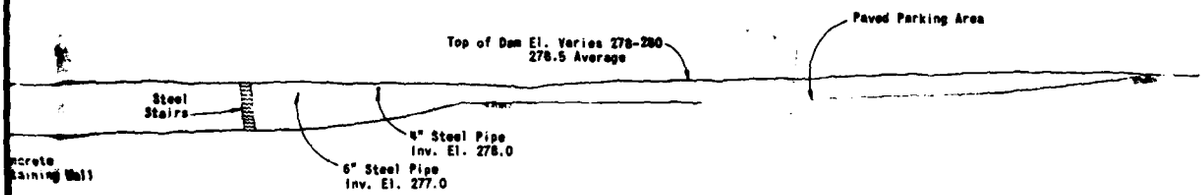
Scale: 1" = 20'

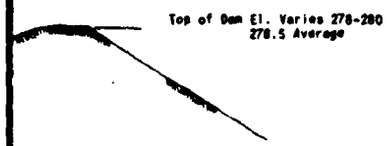
SECTIO

Scale:

FIGURE 2







ECTION B-B
Scales 1" = 20'

ROALD HAESTAD, INC CONSULTING ENGINEERS WATERBURY, CONNECTICUT		U.S ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS		
NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS THURSTON POND DAM				
DRAWN	CHECKED	APPROVED	SCALE AS NOTED	
JRS	RGL	RH	DATE DEC 1980	PAGE B-1

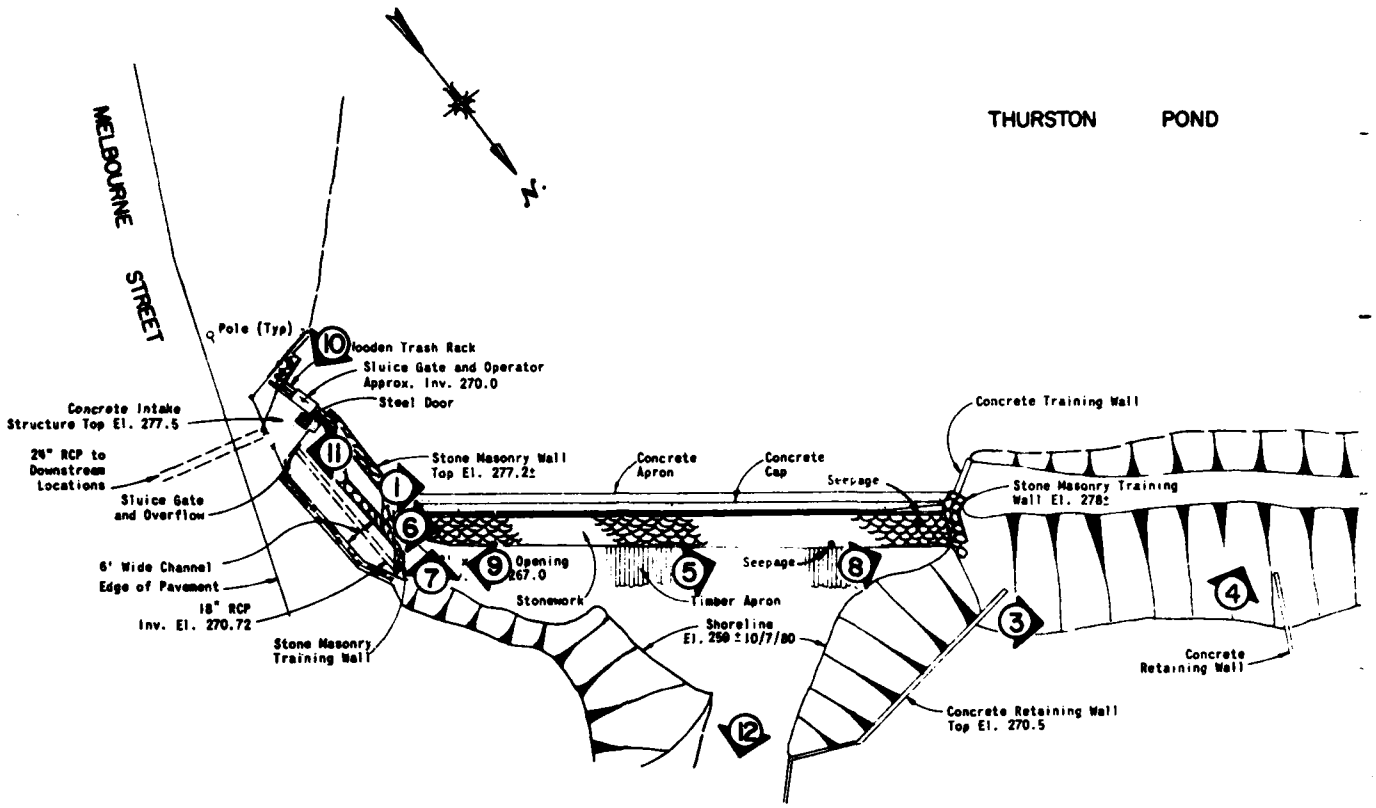
LIST OF REFERENCES

The following references are located at UniRoyal, Inc., Chemical Division, Elm Street, Naugatuck, Connecticut.

1. Engineering Report to UniRoyal, Inc., Chemical Division, Naugatuck, Connecticut, on Surface Water Availability, Character and Treatment, Phase I, I. Laird Newell, P.E., Consulting Engineer, 3/10/80.
2. Miscellaneous plans on industrial water supply pipeline from dam to downstream locations.

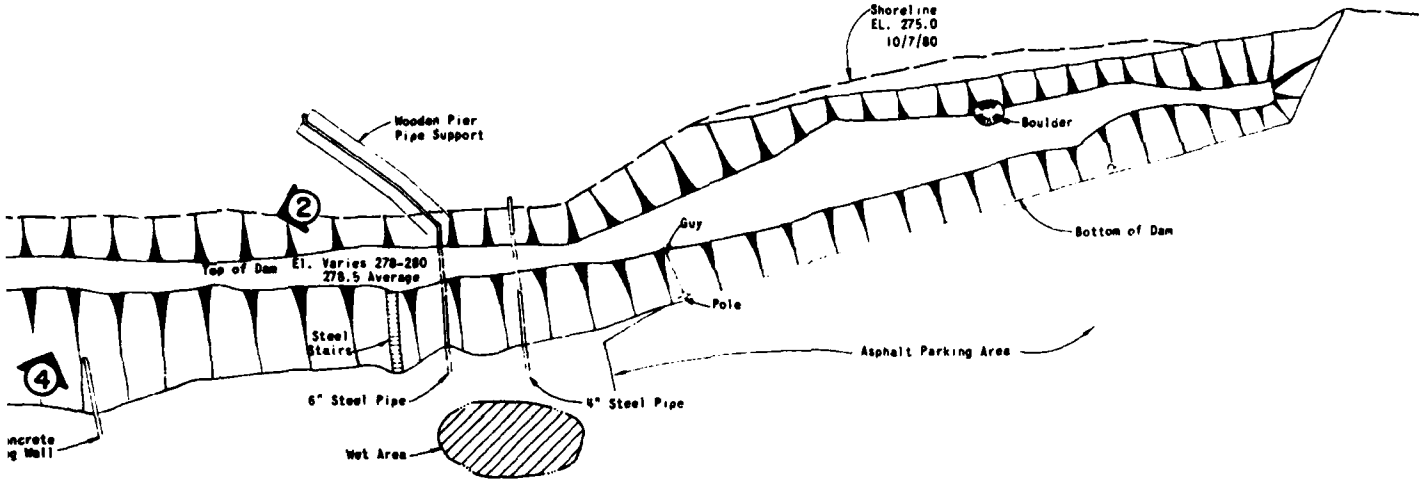
APPENDIX C

PHOTOGRAPHS



Denotes photo number and direction in which photo was taken

FIGURE 3



ROALD HAESTAD, INC. *CONSULTING ENGINEERS* WATERBURY, CONNECTICUT	US ARMY ENGINEER DIV NEW ENGLAND *CORPS OF ENGINEERS* WALTHAM, MASS

NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS

PHOTO LOCATION PLAN
THURSTON POND DAM
NAUGATUCK, CONNECTICUT

DRAWN	CHECKED	APPROVED	SCALES
JRS	RGL	PH	1" = 40'

DATE 1/1/80 Page C-1

2

PHOTO NO. 1

DAM FROM RIGHT ABUTMENT.
NOTE EROSION ON CREST AND TREES
AND BRUSH ON SLOPES.

PHOTO NO. 2

UPSTREAM SLOPE. NOTE TREES AND BRUSH
AND LACK OF RIPRAP SLOPE PROTECTION.

U.S.ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASSACHUSETTS	NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	THURSTON POND DAM LONG MEADOW POND BROOK NAUGATUCK, CONNECTICUT CT 00129 14 OCTOBER 1980
ROALD HAESTAD, INC. CONSULTING ENGINEERS WATERBURY, CONNECTICUT		

PHOTO NO. 3

DOWNSTREAM SLOPE OF DAM NEAR
SPILLWAY. NOTE TREE AND BRUSH GROWTH.

PHOTO NO. 4

EROSION PATH ON DOWNSTREAM SLOPE.

U.S.ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASSACHUSETTS	NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	THURSTON POND DAM LONG MEADOW POND BROOK NAUGATUCK, CONNECTICUT CT 00129 14 OCTOBER 1980
ROALD HAESTAD, INC. CONSULTING ENGINEERS WATERBURY, CONNECTICUT		

PHOTO NO. 5

DOWNSTREAM FACE OF SPILLWAY. NOTE SEEPAGE THROUGH WALL AND VOIDS IN STONE MASONRY.

PHOTO NO. 6

SPILLWAY FROM RIGHT ABUTMENT. NOTE LOGS AT BASE AND CONCRETE CAP.

U.S.ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASSACHUSETTS	NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	THURSTON POND DAM LONG MEADOW POND BROOK NAUGATUCK, CONNECTICUT CT 00129 14 OCTOBER 1980
ROALD HAESTAD, INC. CONSULTING ENGINEERS WATERBURY, CONNECTICUT		

PHOTO NO. 7

POSSIBLE ABANDONED OUTLET ON DOWNSTREAM FACE OF SPILLWAY ADJACENT TO RIGHT ABUTMENT.

PHOTO NO. 8

VOIDS IN LEFT TRAINING WALL, DOWNSTREAM OF SPILLWAY.

U.S.ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASSACHUSETTS	NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	THURSTON POND DAM
		LONG MEADOW POND BROOK
		NAUGATUCK, CONNECTICUT
ROALD HAESTAD, INC. CONSULTING ENGINEERS WATERBURY, CONNECTICUT		CT 00129
		14 OCTOBER 1980

PHOTO NO. 9

RIGHT TRAINING WALL
DOWNSTREAM OF SPILLWAY.
NOTE 18-INCH OUTLET PIPE
NEAR TOP OF WALL.
WATER ORIGINATES FROM OVERFLOW
CHANNEL AT INTAKE STRUCTURE.

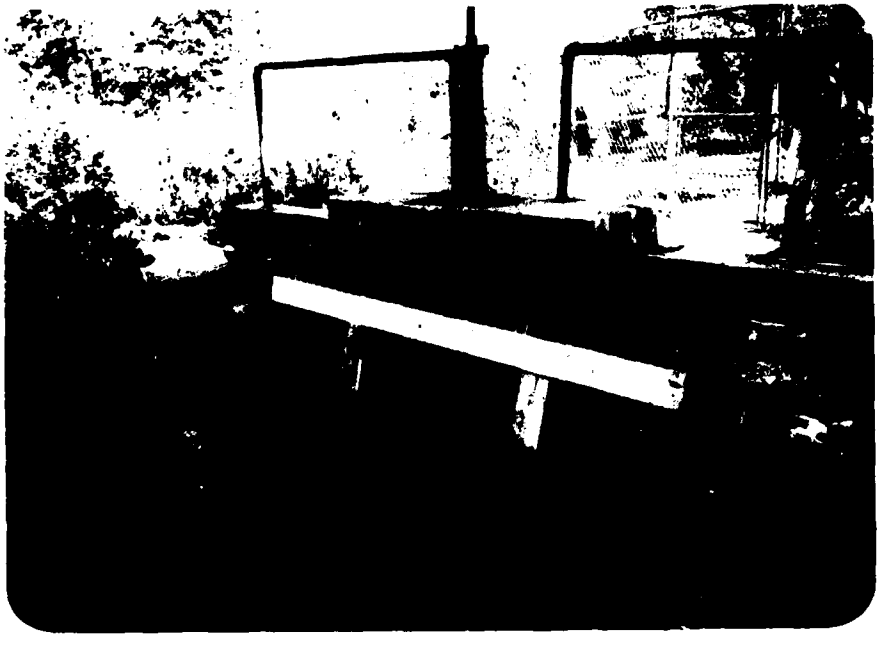


PHOTO NO. 10

OVERFLOW AND OUTLET
GATE AT INTAKE
STRUCTURE.

U.S.ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASSACHUSETTS	NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	THURSTON POND DAM LONG MEADOW POND BROOK NAUGATUCK, CONNECTICUT CT 00129 14 OCTOBER 1980
ROALD HAESTAD, INC. CONSULTING ENGINEERS WATERBURY, CONNECTICUT		

PHOTO NO. 11

INTAKE STRUCTURE AT
RIGHT ABUTMENT

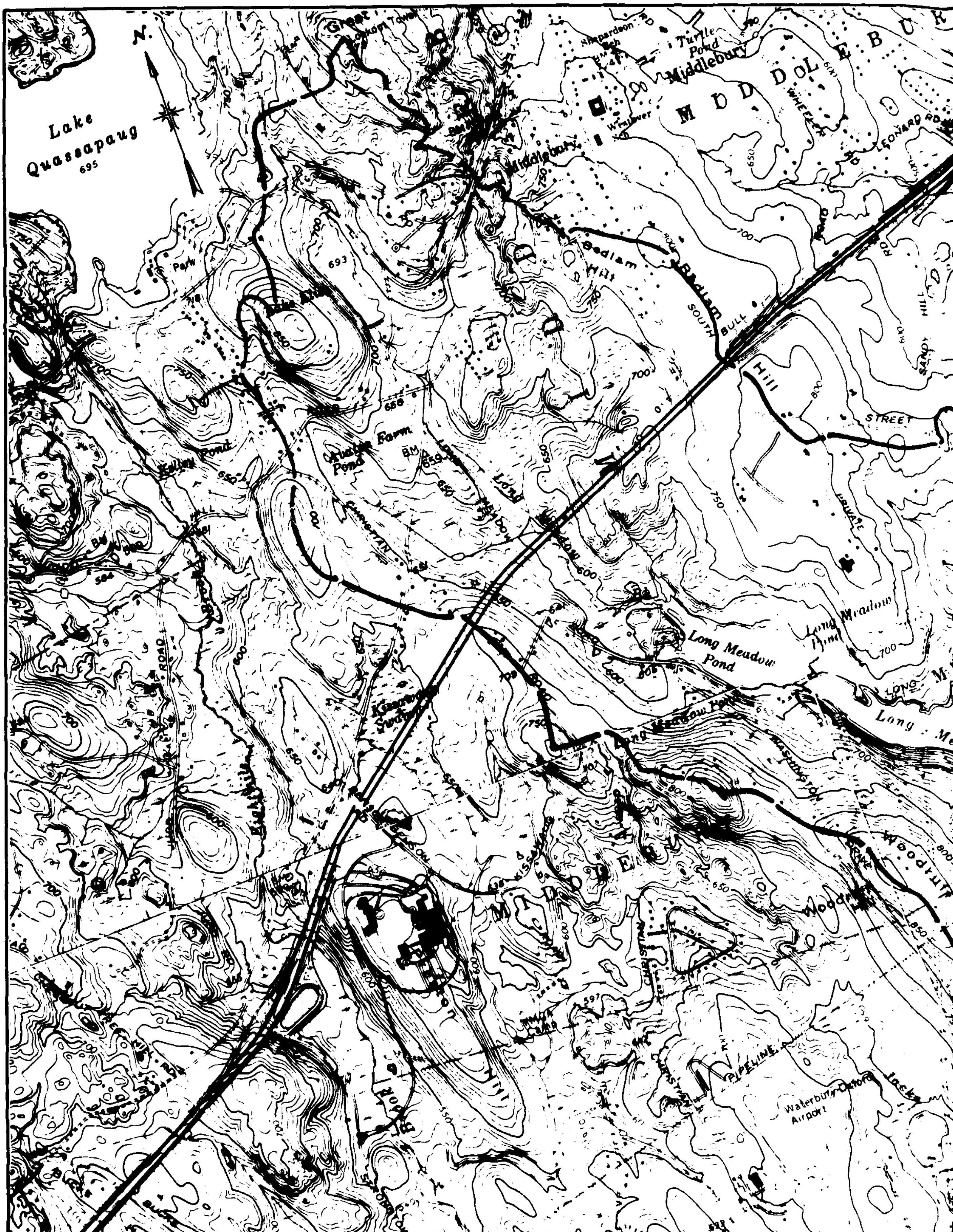
PHOTO NO. 12

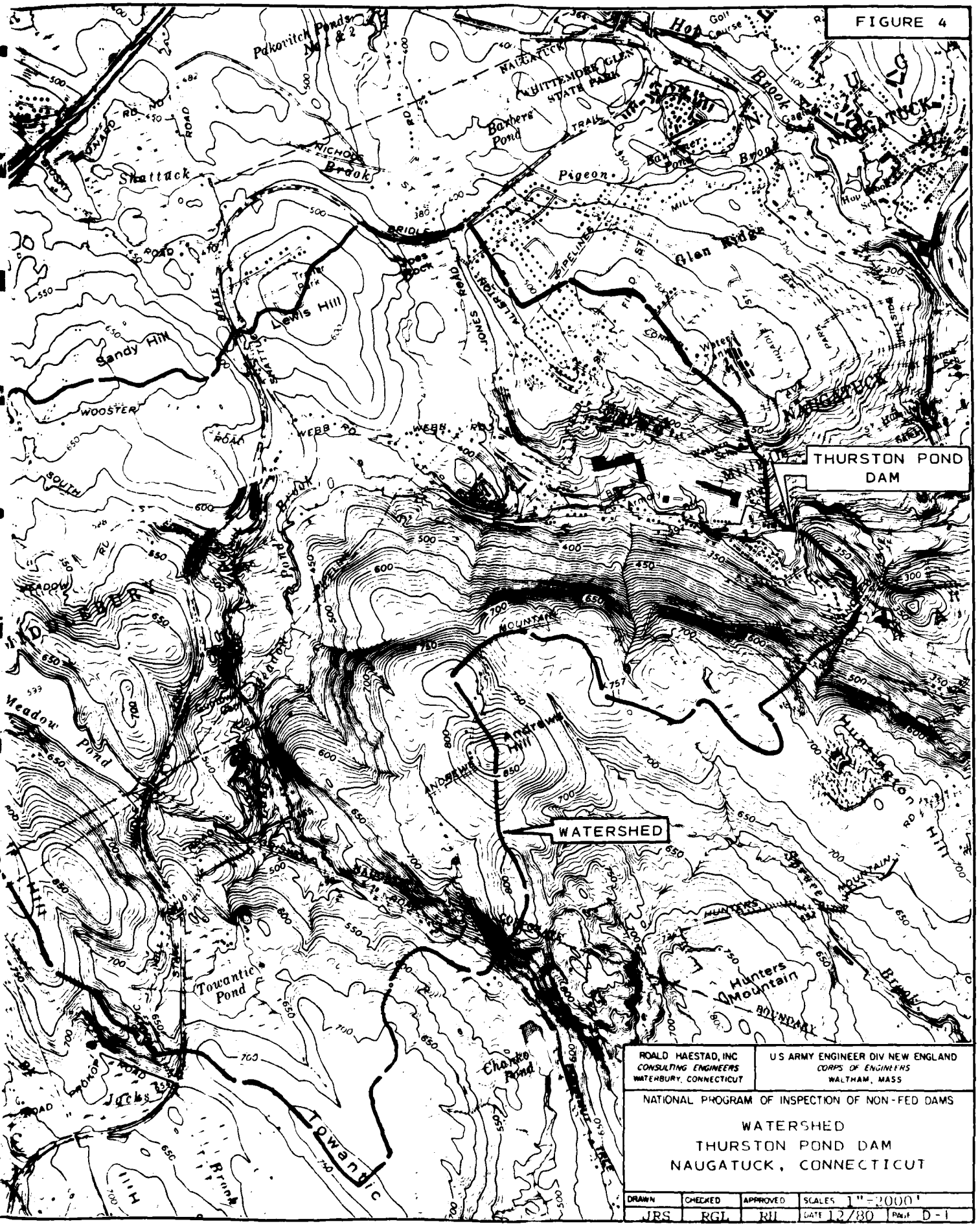
DOWNSTREAM CHANNEL

U.S.ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASSACHUSETTS	NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	THURSTON POND DAM LONG MEADOW POND BROOK NAUGATUCK, CONNECTICUT CT 00129 14 OCTOBER 1980
ROALD HAESTAD, INC. CONSULTING ENGINEERS WATERBURY, CONNECTICUT		

APPENDIX D

HYDROLOGIC AND HYDRAULIC COMPUTATIONS


N.
Lake
Quassapaug
695
Turtle
Pond
Middlebury
Bedlam
Hill
SOUTH
BULL
Hill
STREET
LEONARD RD
WHEELER
SANDY
HILL
PRIVATE
Kelley Pond
Long Meadow
Pond
Long Meadow
Pond
WASHINGTON
Woodruff
PIPELINE
Waterbury-Oxford
Airport



ROALD HAESTAD, INC CONSULTING ENGINEERS WATERBURY, CONNECTICUT	US ARMY ENGINEER DIV NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS

NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS

WATERSHED
THURSTON POND DAM
NAUGATUCK, CONNECTICUT

DRAWN	CHECKED	APPROVED	SCALES 1"=2000'
JRS	RGL	RH	DATE 12/80 PLATE D-1

BY SAL DATE 10/13/80 **ROALD HAESTAD, INC.** SHEET NO 1 OF 24

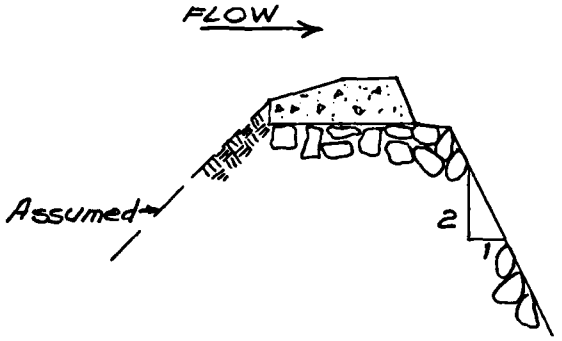
CONSULTING ENGINEERS

CKD BY RLS DATE 11/10/80 37 Brookside Road - Waterbury, Conn. 06708 JOB NO 49-022

SUBJECT THURSTON POND DAM - Project Discharge Capacity

SPILLWAY CROSS SECTION:

Scale: 1" = 5' V & H



FORMULA:

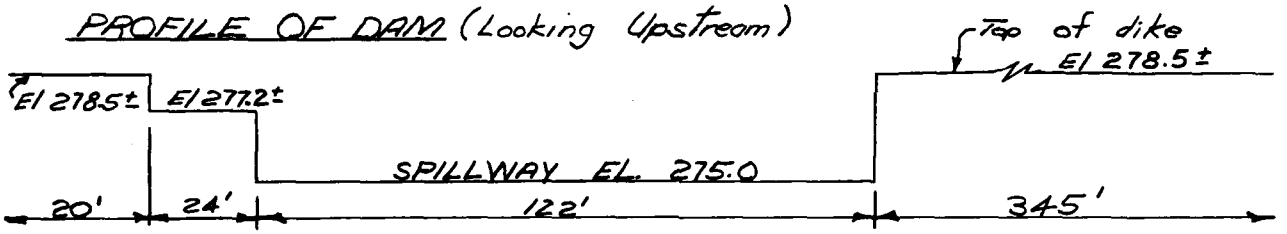
$Q = CLH^{3/2}$

Spillway Discharge Coefficient = 3.0

Spillway Length = 122 ft

Shelf & Dam Discharge Coefficient = 2.7

PROFILE OF DAM (Looking Upstream)



Elev (feet)	Spillway Discharge Capacity (cfs)	Shelf Discharge Capacity (cfs)	Total Project Disch. Cap. (cfs)
275	0	0	0
275.5	129	0	129
276	366	0	366
276.5	672	0	672
277	1,035	0	1,035
277.5	1,447	11	1,458
278	1,902	46	1,948
278.5	2,397	96	2,493

SUBJECT THURSTON POND DAM - Project Discharge Capacity

Continued:

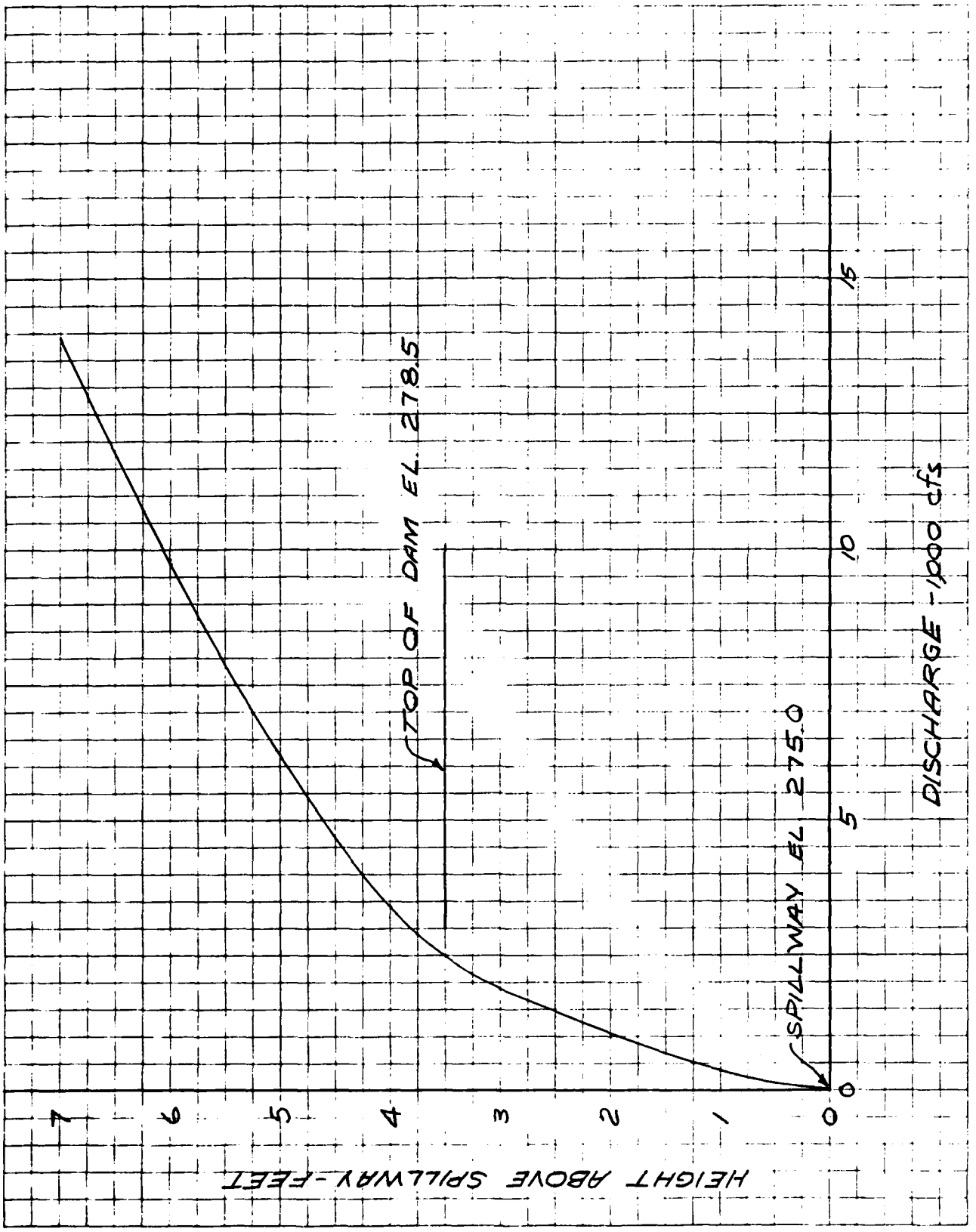
Elev (feet)	Spillway Disch. Cap. (cfs)	Shelf Disch. Cap. (cfs)	Dam Disch. Cap. (cfs)	Total Project Disch. Capacity (cfs)
278.5	2,397	96	0	2,493
279	2,928	156	348	3,432
280	4,092	304	1,810	6,206
281	5,379	480	3,896	9,755
282	6,778	681	6,453	13,912

BY SAL DATE 10/14/80 **ROALD HAESTAD, INC.** SHEET NO 3 OF 24

CONSULTING ENGINEERS

CKD BY DLS DATE 11/25/80 37 Brookside Road - Waterbury, Conn. 06708 JOB NO 49-022

SUBJECT THURSTON POND DAM - Project Discharge Capacity Curve



BY JRR DATE 10-10-80 **ROALD HAESTAD, INC.** SHEET NO 4 OF 24

CONSULTING ENGINEERS

CKD BY DLS DATE 11/10/80 37 Brookside Road - Waterbury, Conn. 06708 JOB NO 49-022

SUBJECT THURSTON POND DAM — SURCHARGE STORAGE CAPACITY

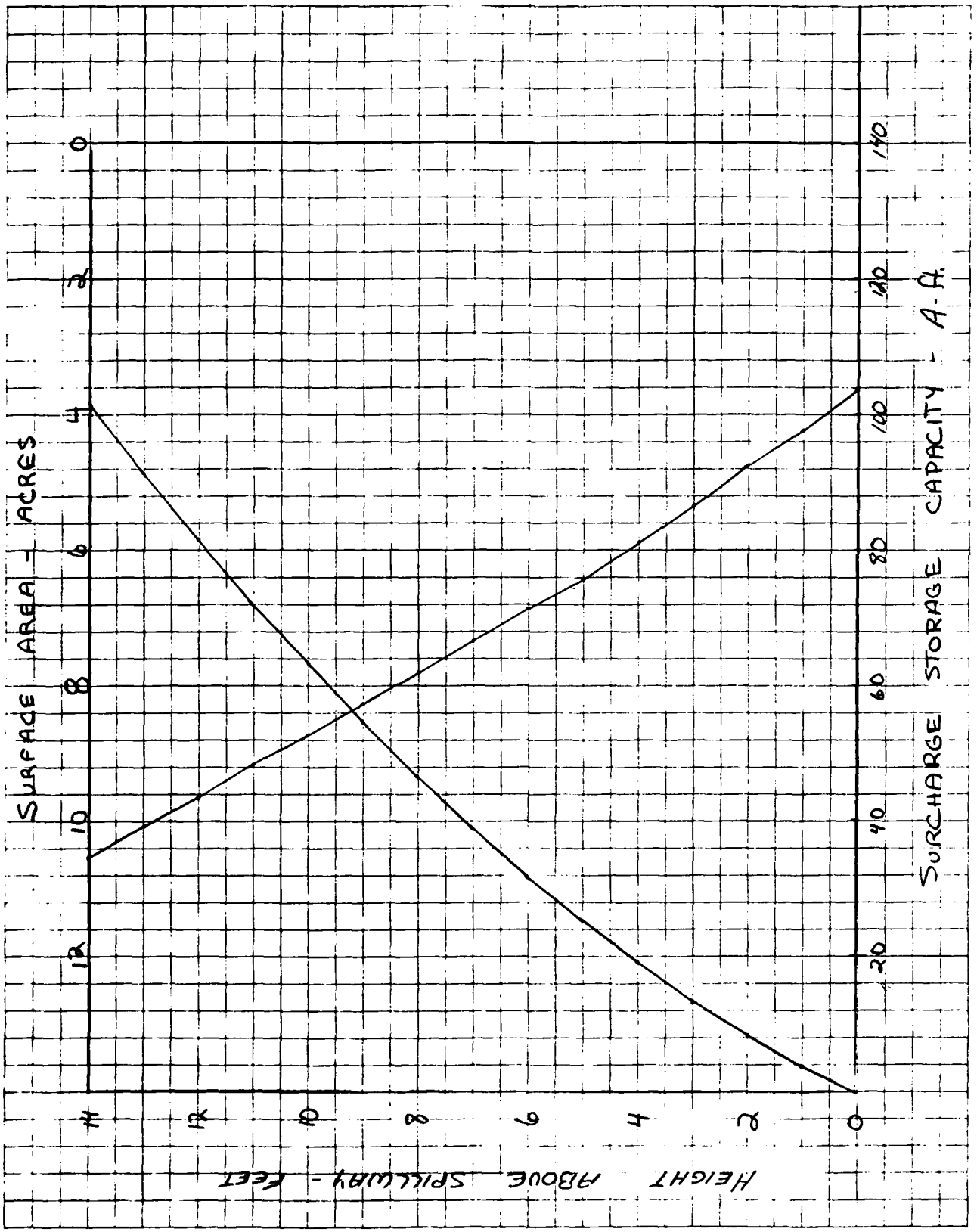
Height Above Spillway (Ft)	Surface Area (Acres)	Average Surface Area (Acres)	Storage Capacity (Acre-Ft)
0	3.67 ✓		0
		3.95 ✓	
1	4.22		3.95 ✓
		4.50	
2	4.77		8.45
		5.05	
3	5.32		13.50
		5.6	
4	5.88		19.1
		6.16	
5	6.43 ✓		25.25
		6.66 ✓	
6	6.89 ✓		31.91 ✓
		7.12	
7	7.34		39.03
		7.57	
8	7.80		46.60
		8.03	
9	8.26		54.63
		8.49	
10	8.72		63.12
		8.95	
11	9.17		72.07
		9.4	
12	9.63		81.47
		9.86	
13	10.09		91.33
		10.32	
14	10.54		101.65
		10.77	
15	11.0 ✓		112.4

BY IRR DATE 10-10-80 **ROALD HAESTAD, INC.** SHEET NO 5 OF 24

CONSULTING ENGINEERS

CKD BY DLS DATE 11/10/80 37 Brookside Road - Waterbury, Conn. 06708 JOB NO 49-022

SUBJECT THURSTON POND DAM - SURCHARGE STORAGE CAPACITY CURVE



SUBJECT THURSTON POND DAM - Test Flood

Test Flood = 1/2 PMF

Drainage Area = 5010 Acres = 7.8 sq. mi.

From CORPS OF ENG Chart for "Rolling" Terrain

MPF = 1,725 cfs/sq mi

PMF = 1,725 cfs/sq mi × 7.8 sq mi = 13,455 cfs

1/2 PMF = 1/2 (13,455) = 6,728 use 6,730 cfs

Q_{P1} = 6,730 cfs

Note: The storage capacity of the dam is small with respect to the size of the watershed, thus the outflow would be approximately equal to the inflow. Therefore, no flood routing was performed.

H_1 = 5.2 feet above spillway

The dam would be overtopped by approximately 1.7 feet.

Spillway Discharge Capacity (At top of dam) $= C_1 L_1 H_1^{3/2} + C_2 L_2 H_2^{3/2}$

$= 3(22)(3.5)^{3/2} + 2.7(24)(1.3)^{3/2}$

$= 2,397 + 96$

$= 2,493$ use 2,500 cfs

% of Test Flood $= (2500/6,730) \times 100 = 37\%$ of 1/2 PMF

S = Storage at time of failure with water level at top of dam.

S = Storage at spillway level + Surcharge Storage

S = (3.67 acres x 8 ft) + (16 Ac-Ft (From Surcharge Storage Cap. Curve))

S = 29.36 Ac-Ft + 16 Ac-Ft = 45.36 use 45 Ac-Ft

Q_{p1} = Peak Failure Outflow = $8/27\ W_b \sqrt{g}\ Y_o^{3/2}$

W_b = Breach Width - 40% of dam length across river at mid height = 0.4(285') = 114'

Y_o = Total height from river bed to pool level at time of failure = 20'

$Q_{p1} = 8/27\ (114)(\sqrt{32.2})(20)^{3/2} = 17,144$. use 17,150 cfs

Note: The spillway was assumed to be included in the dam breach and therefore the spillway discharge was not added to the dam breach flow.

SECTION NUMBER 1

MELBOURNE & RUBBER
(STORAGE CAPACITY WITHIN REACH)

HEIGHT (FEET)	SURFACE AREA (ACRES)	STORAGE VOLUME (ACRE-FEET)
1.0	0.04	0.0
2.0	0.08	0.1
3.0	0.13	0.2
4.0	0.17	0.3
5.0	0.25	0.6
6.0	0.33	0.8
7.0	0.41	1.2
8.0	0.49	1.7
9.0	0.57	2.2
10.0	0.66	2.8
11.0	0.74	3.5
12.0	0.82	4.3
13.0	0.90	5.2
14.0	0.98	6.1
15.0	1.11	7.1
16.0	1.23	8.3
17.0	1.36	9.6
18.0	1.48	11.0
19.0	1.61	12.6
20.0	1.74	14.2

STORAGE CAPACITY CALCULATED FROM SURFACE AREAS AT KNOWN ELEVATIONS.

SUBJECT THURSTON POND DAM-FLOOD ROUTING AT TOP OF DAM

SECTION NUMBER 1

MELBOURNE & RUBBER

HEIGHT ABOVE INVERT (FEET)	DISCHARGE CAPACITY CONDUIT (CFS)	SPILLWAY (CFS)	TOTAL (CFS)
1.0	143	0	143
2.0	286	0	286
3.0	548	0	548
4.0	809	0	809
5.0	1112	0	1112
6.0	1415	0	1415
7.0	1685	163	1848
8.0	1955	460	2414
9.0	2157	1307	3464
10.0	2359	2608	4967
11.0	2528	4495	7023
12.0	2696	6866	9562
13.0	2865	9809	12674
14.0	3033	13240	16273
15.0	3168	17267	20435
16.0	3303	21811	25114
17.0	3437	26997	30434
18.0	3572	32744	36316
19.0	3724	39172	42896
20.0	3876	46200	50076

STORAGE AT TIME OF FAILURE=S= 45 AC. FT.
LENGTH OF REACH=L= 200 FT

INFLOW INTO REACH=QP1= 17150 CFS
HEIGHT ABOVE CONDUIT INVERT=H1= 14.2 FT.
STORAGE IN REACH=V1= 4.6 AC. FT.

TRIAL REACH OUTFLOW=QP(TRIAL)= 15398 CFS
TRIAL HEIGHT ABOVE CONDUIT INVERT=H(TRIAL)= 13.8 FT.
TRIAL STORAGE IN REACH=V(TRIAL)= 4.1 AC. FT.

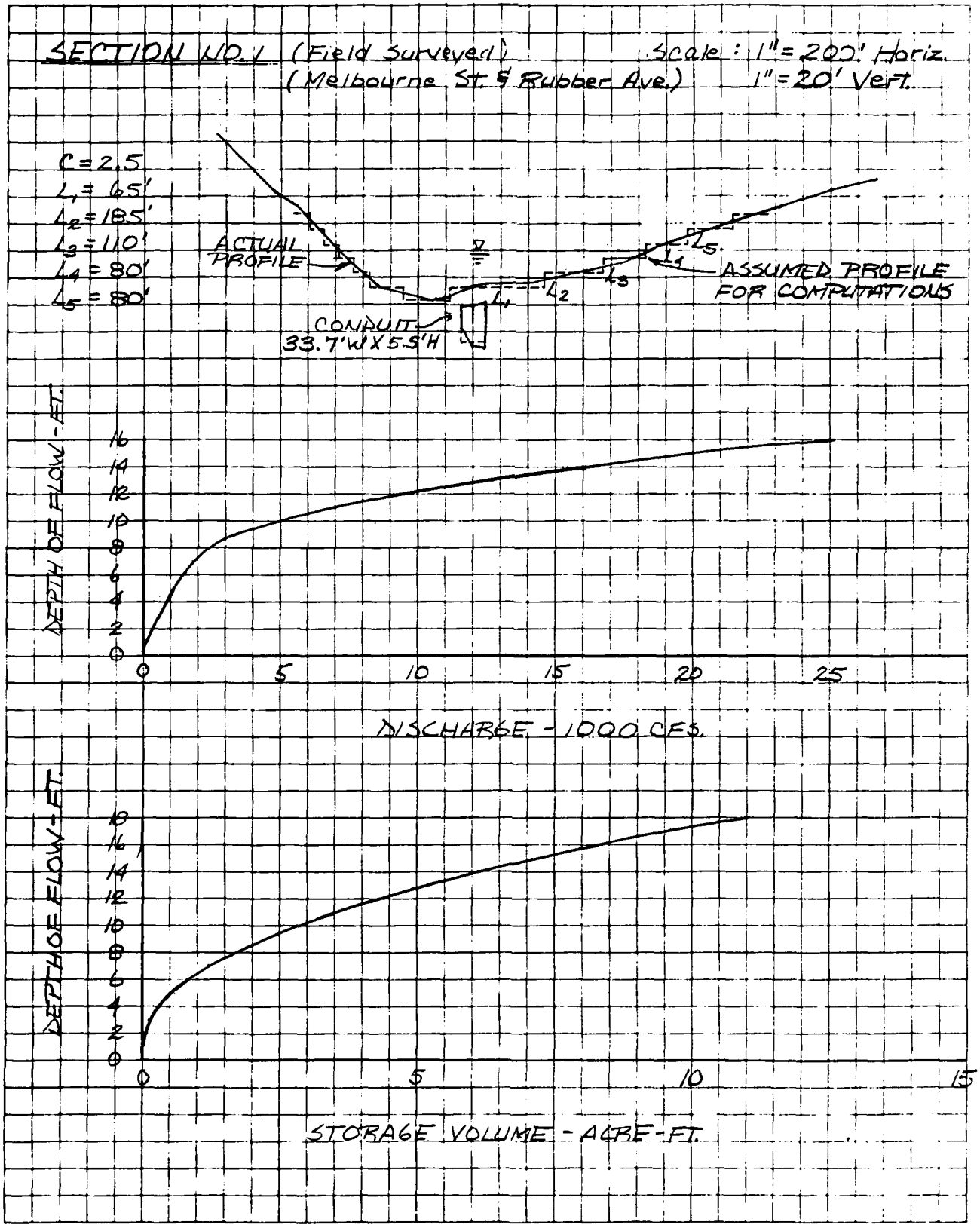
REACH OUTFLOW=QP2= 15483 CFS
HEIGHT ABOVE CONDUIT INVERT=H2= 13.8 FT.

BY LBG DATE 10/18/80 **ROALD HAESTAD, INC.** SHEET NO. 10 OF 24

CONSULTING ENGINEERS

CKD BY SAL DATE 11/28/80 37 Brookside Road - Waterbury, Conn. 06708 JOB NO. 79-022

SUBJECT THURSTON POND DAM - FLOOD ROUTING



BY SAL DATE 11/28/80 ROALD HAESTAD, INC. SHEET NO 11 OF 24

CKD BY DLS DATE 12/1/80 CONSULTING ENGINEERS JOB NO. 049 022

SUBJECT THURSTON POND DAM-FLOOD ROUTING AT TOP OF DAM

SECTION NUMBER 2

RUBBER AVENUE
(STORAGE CAPACITY WITHIN REACH)

HEIGHT (FEET)	SURFACE AREA (ACRES)	STORAGE VOLUME (ACRE-FEET)
1.0	0.02	0.0
2.0	0.03	0.0
3.0	0.05	0.1
4.0	0.06	0.1
5.0	0.11	0.2
6.0	0.17	0.3
7.0	0.22	0.5
8.0	0.28	0.8
9.0	0.33	1.1
10.0	0.38	1.5
11.0	0.44	1.9
12.0	0.49	2.3
13.0	0.55	2.8
14.0	0.60	3.4
15.0	0.72	4.1
16.0	0.84	4.9
17.0	0.96	5.8
18.0	1.08	6.8
19.0	1.20	7.9
20.0	1.32	9.2
21.0	1.44	10.6
22.0	1.56	12.1
23.0	1.68	13.7
24.0	1.80	15.4

STORAGE CAPACITY CALCULATED FROM SURFACE AREAS AT KNOWN ELEVATIONS.

SECTION NUMBER 2

RUBBER AVENUE

HEIGHT ABOVE INVERT (FEET)	DISCHARGE CAPACITY CONDUIT (CFS)	SPILLWAY (CFS)	TOTAL (CFS)
1.0	111	0	111
2.0	221	0	221
3.0	423	0	423
4.0	624	0	624
5.0	884	0	884
6.0	1144	0	1144
7.0	1417	0	1417
8.0	1690	0	1690
9.0	1924	0	1924
10.0	2158	0	2158
11.0	2444	0	2444
12.0	2730	0	2730
13.0	2925	325	3250
14.0	3120	919	4039
15.0	3276	1889	5165
16.0	3432	3166	6598
17.0	3601	4735	8336
18.0	3770	6553	10323
19.0	3939	8642	12581
20.0	4108	10970	15078
21.0	4238	13553	17791
22.0	4368	16363	20731
23.0	4498	19448	23946
24.0	4628	22779	27407

STORAGE AT TIME OF FAILURE=S= 45 AC. FT.
LENGTH OF REACH=L= 1400 FT

INFLOW INTO REACH=QP1= 15483 CFS
HEIGHT ABOVE CONDUIT INVERT=H1= 20.1 FT.
STORAGE IN REACH=V1= 7.4 AC. FT.

TRIAL REACH OUTFLOW=QP(TRIAL)= 12926 CFS
TRIAL HEIGHT ABOVE CONDUIT INVERT=H(TRIAL)= 19.1 FT.
TRIAL STORAGE IN REACH=V(TRIAL)= 6.1 AC. FT.

REACH OUTFLOW=QP2= 13148 CFS
HEIGHT ABOVE CONDUIT INVERT=H2= 19.2 FT.

BY LRG DATE 11/11/80 **ROALD HAESTAD, INC.** SHEET NO 13 OF 24

CONSULTING ENGINEERS

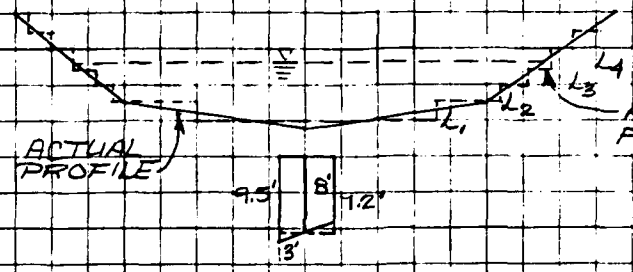
CKD BY SAL DATE 11/28/80 37 Brookside Road - Waterbury, Conn. 06708 JOB NO 49-022

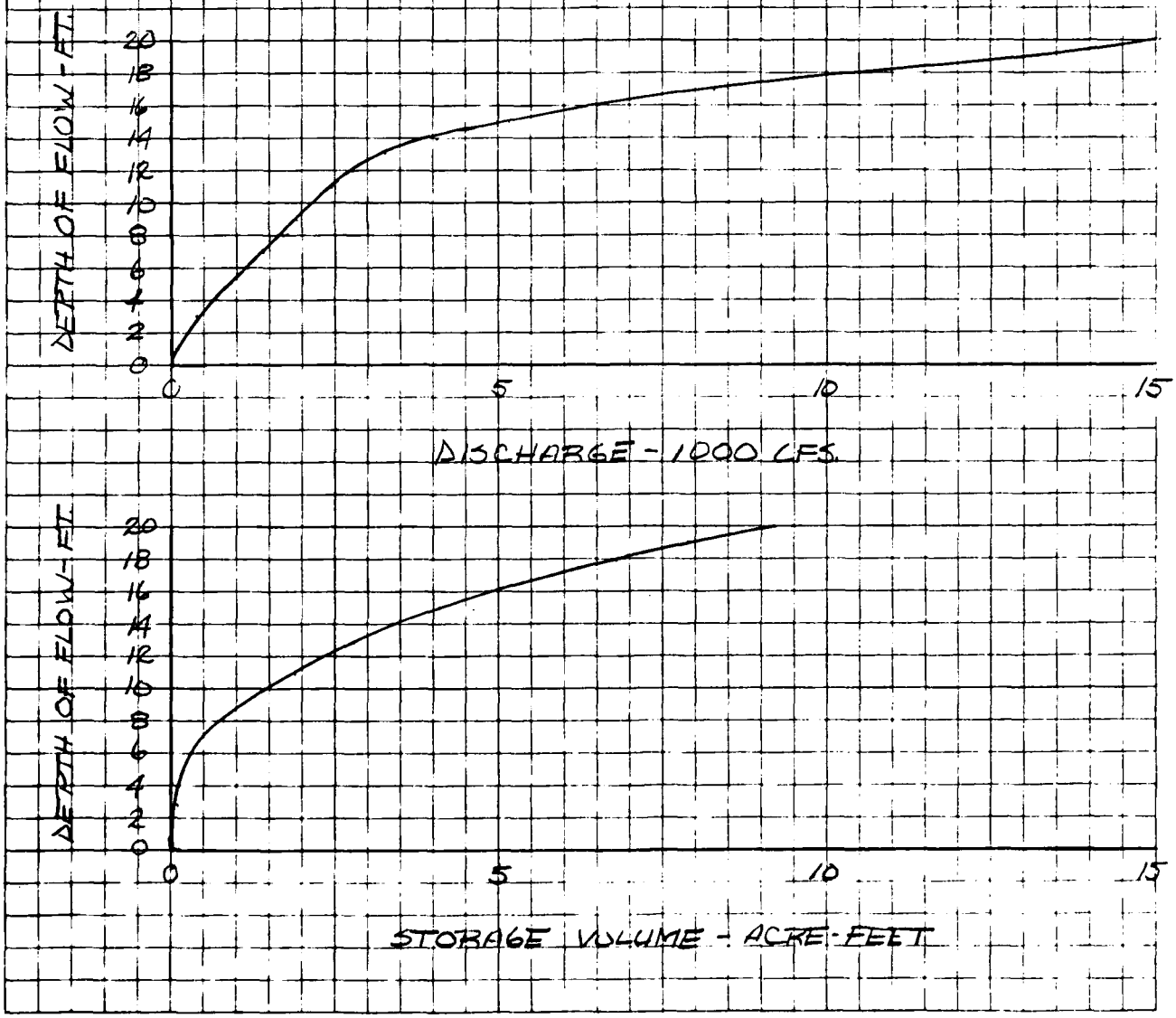
SUBJECT THURSTON POND DAM - FLOOD ROUTING

SECTION NO 2 - (Rubber Ave.)

Scale: 1" = 100' Horiz
1" = 20' Vert.

C = 2.5
L_1 = 130'
L_2 = 80'
L_3 = 25'
L_4 = 25'





SECTION NUMBER 3

ANDREWS AVENUE
(STORAGE CAPACITY WITHIN REACH)

HEIGHT (FEET)	SURFACE AREA (ACRES)	STORAGE VOLUME (ACRE-FEET)
1.0	0.12	0.1
2.0	0.24	0.2
3.0	0.36	0.5
4.0	0.48	1.0
5.0	0.60	1.5
6.0	0.82	2.2
7.0	1.04	3.1
8.0	1.26	4.3
9.0	1.48	5.7
10.0	1.70	7.2
11.0	1.92	9.1
12.0	2.14	11.1
13.0	2.36	13.3
14.0	2.58	15.8
15.0	2.80	18.5
16.0	2.98	21.4
17.0	3.16	24.5
18.0	3.34	27.7
19.0	3.52	31.1
20.0	3.70	34.7
21.0	3.88	38.5
22.0	4.06	42.5
23.0	4.24	46.7
24.0	4.42	51.0

STORAGE CAPACITY CALCULATED FROM SURFACE AREAS AT KNOWN ELEVATIONS.

SUBJECT THURSTON POND DAM-FLOOD ROUTING AT TOP OF DAM

SECTION NUMBER 3

ANDREWS AVENUE

HEIGHT ABOVE INVERT (FEET)	D I S C H A R G E C A P A C I T Y CONDUIT (CFS)	SPILLWAY (CFS)	TOTAL (CFS)
1.0	126	0	126
2.0	252	0	252
3.0	462	0	462
4.0	672	0	672
5.0	966	0	966
6.0	1260	0	1260
7.0	1554	0	1554
8.0	1848	0	1848
9.0	2128	0	2128
10.0	2408	0	2408
11.0	2674	725	3399
12.0	2940	2051	4991
13.0	3150	3767	6917
14.0	3360	5800	9160
15.0	3528	8356	11884
16.0	3696	11362	15058
17.0	3878	14726	18604
18.0	4060	18405	22465
19.0	4214	22645	26859
20.0	4368	27379	31747
21.0	4522	32509	37031
22.0	4676	37995	42671
23.0	4802	44082	48884
24.0	4928	50703	55631

STORAGE AT TIME OF FAILURE=S= 45 AC. FT.
LENGTH OF REACH=L= 550 FT

INFLOW INTO REACH=QP1= 13148 CFS
HEIGHT ABOVE CONDUIT INVERT=H1= 15.4 FT.
STORAGE IN REACH=V1= 12.2 AC. FT.

TRIAL REACH OUTFLOW=QP(TRIAL)= 9574 CFS
TRIAL HEIGHT ABOVE CONDUIT INVERT=H(TRIAL)= 14.2 FT.
TRIAL STORAGE IN REACH=V(TRIAL)= 8.8 AC. FT.

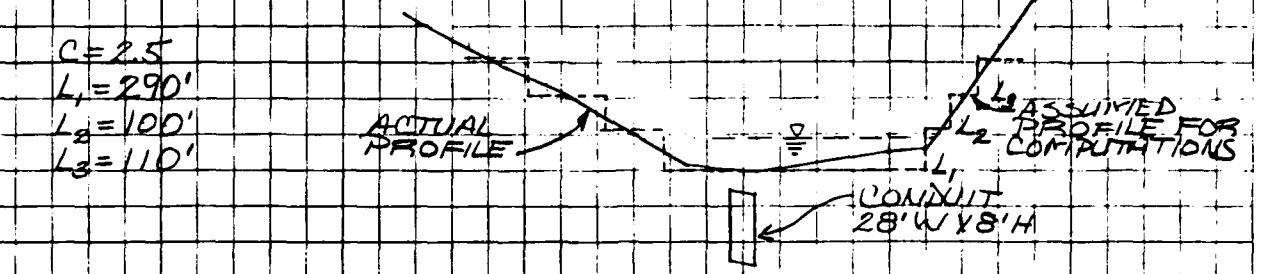
REACH OUTFLOW=QP2= 10075 CFS
HEIGHT ABOVE CONDUIT INVERT=H2= 14.3 FT.

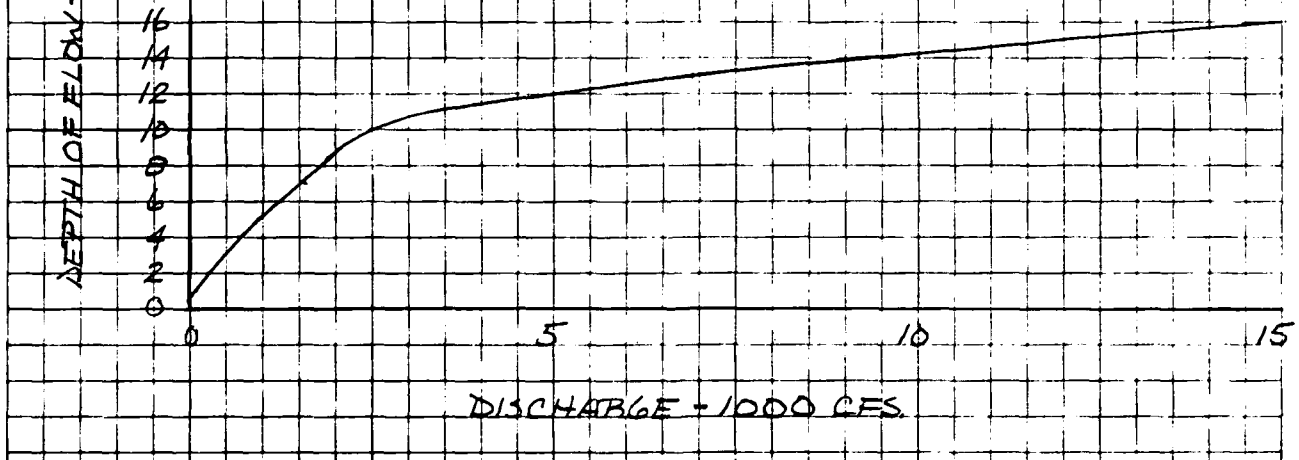
SUBJECT THURSTON POND DAM - FLOOD ROUTING

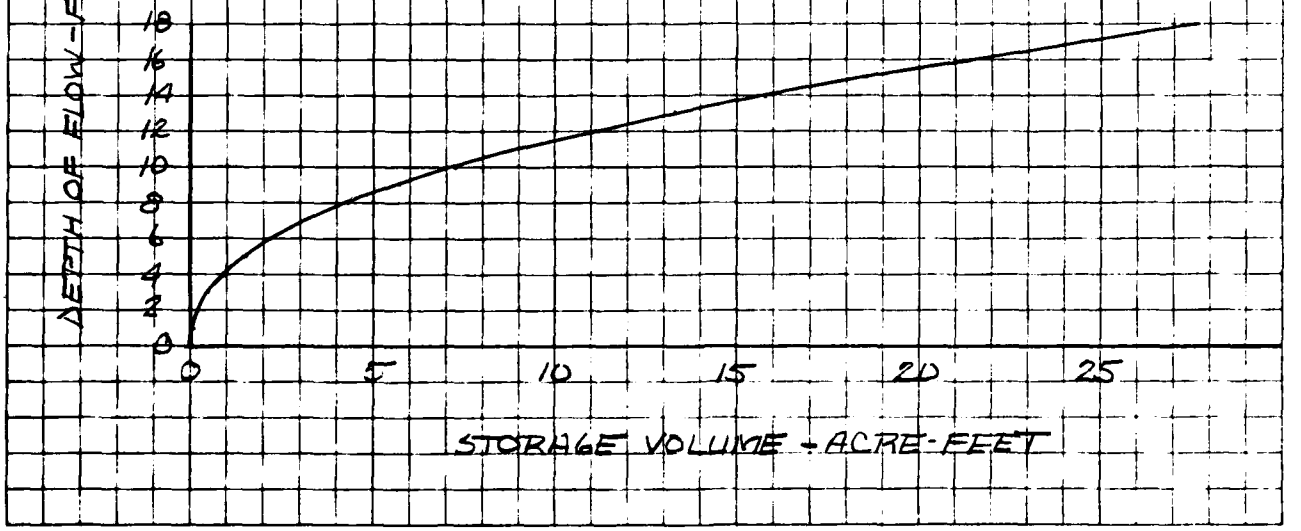
SECTION NO.3 (Field Surveyed) (Andrews Ave.)

Scale: 1" = 100' Horiz.
1" = 20' Vert.

C = 2.5
L_1 = 290'
L_2 = 100'
L_3 = 110'







SECTION NUMBER 4

ARCH STREET
(STORAGE CAPACITY WITHIN REACH)

HEIGHT (FEET)	SURFACE AREA (ACRES)	STORAGE VOLUME (ACRE-FEET)
1.0	0.08	0.0
2.0	0.15	0.2
3.0	0.23	0.3
4.0	0.50	0.7
5.0	0.76	1.3
6.0	1.03	2.2
7.0	1.30	3.4
8.0	1.57	4.8
9.0	1.83	6.5
10.0	2.10	8.5
11.0	2.37	10.7
12.0	2.63	13.2
13.0	2.90	16.0
14.0	3.52	19.2
15.0	4.13	23.0
16.0	4.75	27.5
17.0	5.37	32.5
18.0	5.98	38.2
19.0	6.60	44.5
20.0	7.22	51.4

STORAGE CAPACITY CALCULATED FROM SURFACE AREAS AT KNOWN ELEVATIONS.

SECTION NUMBER 4

ARCH STREET

HEIGHT ABOVE INVERT (FEET)	DISCHARGE CAPACITY CONDUIT (CFS)	SPILLWAY (CFS)	TOTAL (CFS)
1.0	106	0	106
2.0	213	0	213
3.0	406	0	406
4.0	600	0	600
5.0	800	0	800
6.0	1000	0	1000
7.0	1188	0	1188
8.0	1375	350	1725
9.0	1513	990	2502
10.0	1650	1819	3469
11.0	1763	2800	4562
12.0	1875	4263	6138
13.0	1975	6134	8109
14.0	2075	8301	10376
15.0	2163	10720	12882
16.0	2250	13663	15913
17.0	2350	17060	19410
18.0	2450	20810	23260
19.0	2538	24869	27406
20.0	2625	29359	31984

STORAGE AT TIME OF FAILURE=S= 45 AC. FT.
LENGTH OF REACH=L= 900 FT

INFLOW INTO REACH=QP1= 10075 CFS
HEIGHT ABOVE CONDUIT INVERT=H1= 13.9 FT.
STORAGE IN REACH=V1= 12.3 AC. FT.

TRIAL REACH OUTFLOW=QP(TRIAL)= 7332 CFS
TRIAL HEIGHT ABOVE CONDUIT INVERT=H(TRIAL)= 12.6 FT.
TRIAL STORAGE IN REACH=V(TRIAL)= 8.4 AC. FT.

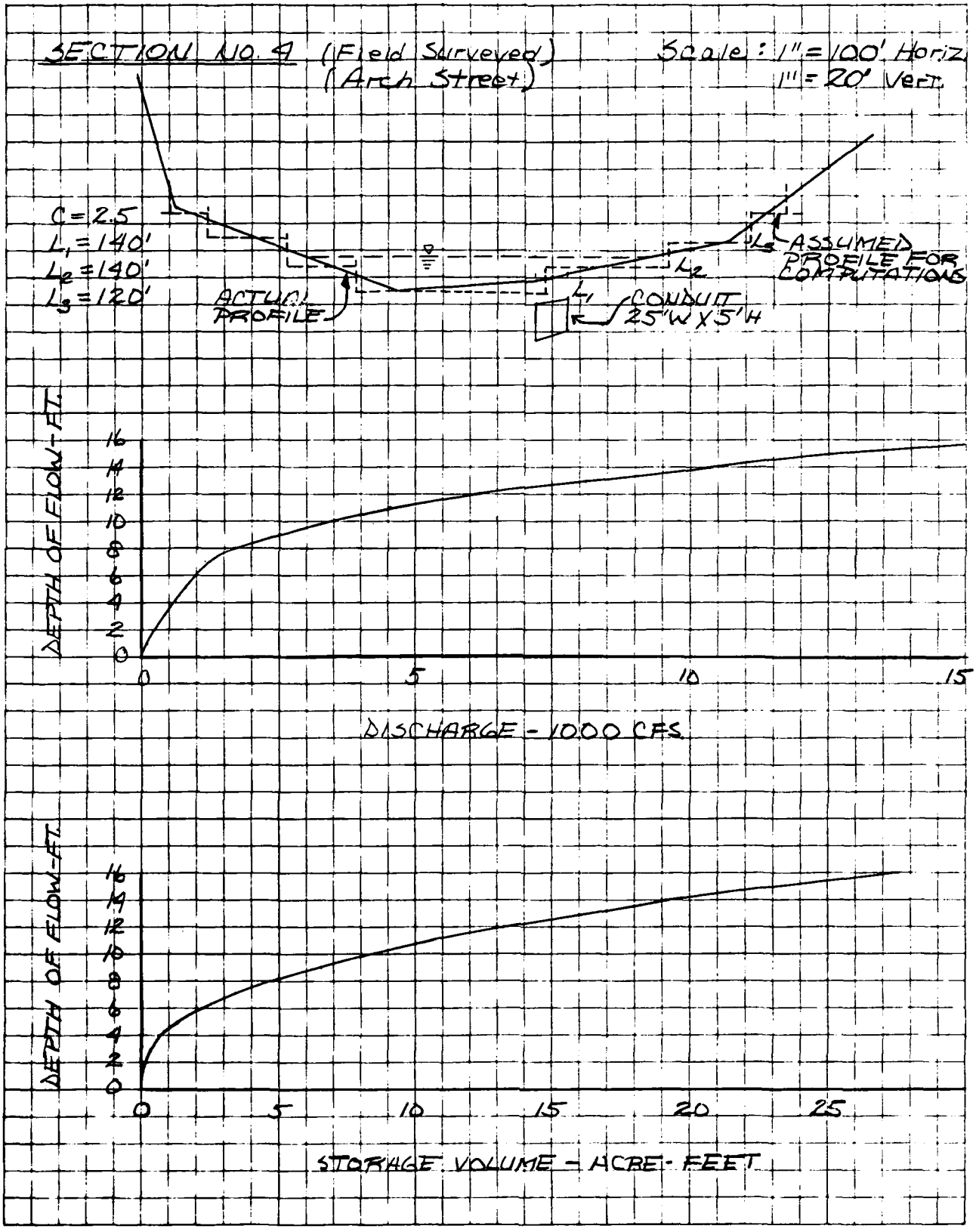
REACH OUTFLOW=QP2= 7766 CFS
HEIGHT ABOVE CONDUIT INVERT=H2= 12.8 FT.

BY B.G. DATE 11/11/80 **ROALD HAESTAD, INC.** SHEET NO 19 OF 24

CONSULTING ENGINEERS

CKD BY SAL DATE 11/28/80 37 Brookside Road - Waterbury, Conn. 06708 JOB NO 49-022

SUBJECT THURSTON POND DAM - FLOOD ROUTING



SECTION NUMBER 5

CHERRY STREET
(STORAGE CAPACITY WITHIN REACH)

HEIGHT (FEET)	SURFACE AREA (ACRES)	STORAGE VOLUME (ACRE-FEET)
1.0	0.11	0.1
2.0	0.52	0.4
3.0	0.94	1.1
4.0	1.35	2.2
5.0	1.77	3.8
6.0	2.18	5.8
7.0	2.59	8.2
8.0	3.01	11.0
9.0	3.42	14.2
10.0	3.84	17.8
11.0	4.25	21.9
12.0	4.40	26.2
13.0	4.55	30.7
14.0	4.70	35.3
15.0	4.85	40.0
16.0	4.99	45.0

STORAGE CAPACITY CALCULATED FROM SURFACE AREAS AT KNOWN ELEVATIONS.

SECTION NUMBER 5

CHERRY STREET

HEIGHT ABOVE INVERT (FEET)	D I S C H A R G E C A P A C I T Y CONDUIT (CFS)	SPILLWAY (CFS)	TOTAL (CFS)
1.0	104	0	104
2.0	209	0	209
3.0	402	0	402
4.0	596	0	596
5.0	849	0	849
6.0	1103	0	1103
7.0	1311	363	1674
8.0	1520	1025	2545
9.0	1699	2596	4295
10.0	1877	4915	6793
11.0	1997	8405	10402
12.0	2116	12866	14982
13.0	2250	18732	20982
14.0	2384	25783	28167
15.0	2503	34108	36611
16.0	2622	43528	46151

STORAGE AT TIME OF FAILURE=S= 45 AC. FT.
LENGTH OF REACH=L= 400 FT

INFLOW INTO REACH=QP1= 7766 CFS
HEIGHT ABOVE CONDUIT INVERT=H1= 10.3 FT.
STORAGE IN REACH=V1= 8.1 AC. FT.

TRIAL REACH OUTFLOW=QP(TRIAL)= 6371 CFS
TRIAL HEIGHT ABOVE CONDUIT INVERT=H(TRIAL)= 9.8 FT.
TRIAL STORAGE IN REACH=V(TRIAL)= 6.4 AC. FT.

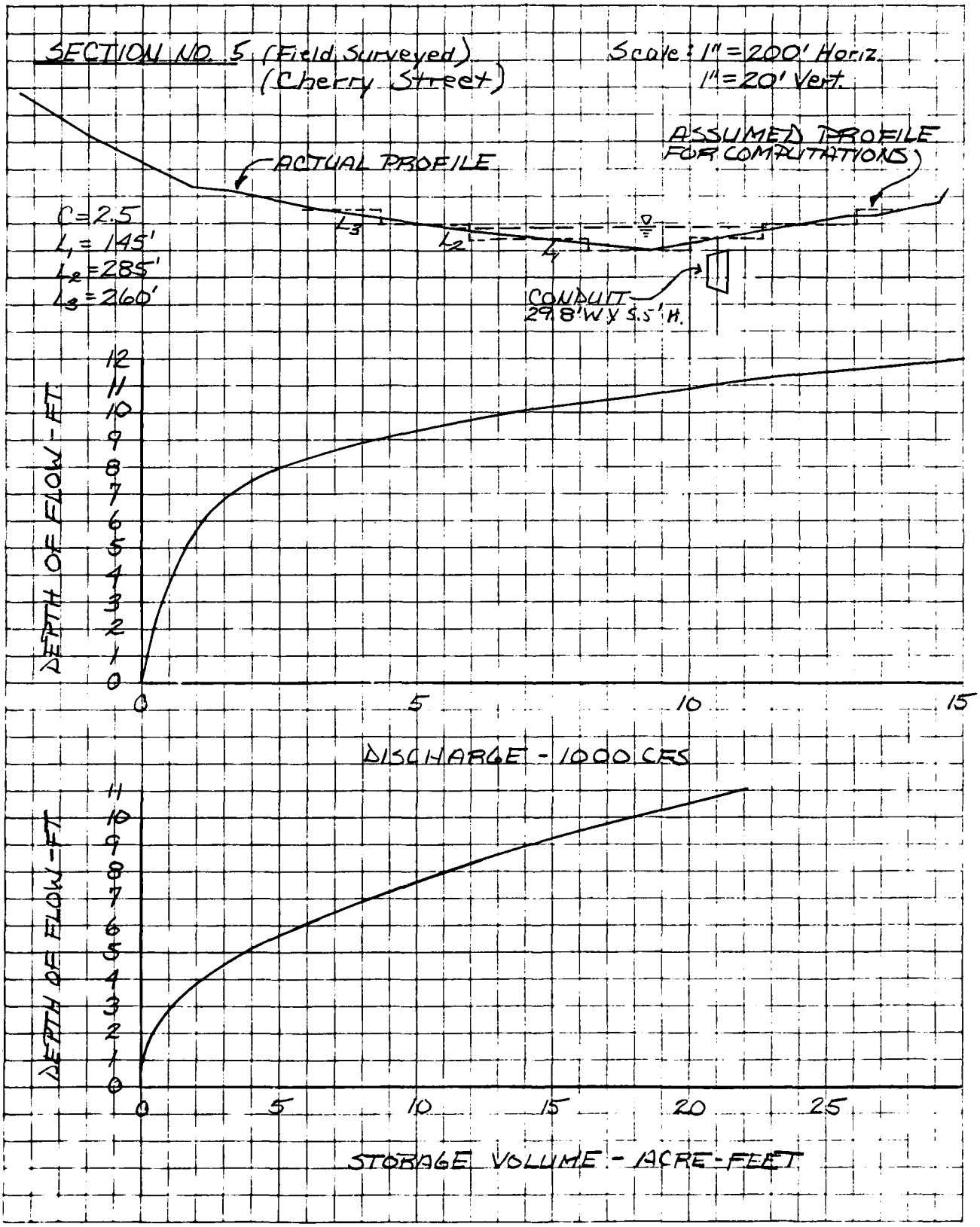
REACH OUTFLOW=QP2= 6518 CFS
HEIGHT ABOVE CONDUIT INVERT=H2= 9.9 FT.

BY LBG DATE 11/11/80 **ROALD HAESTAD, INC.** SHEET NO 22 OF 24

CONSULTING ENGINEERS

CKD BY SAL DATE 11/28/80 37 Brookside Road - Waterbury, Conn. 06708 JOB NO 49-022

SUBJECT THURSTON POND DAM - FLOOD ROUTING



SECTION NO 6: (Uniroyal Culverts)

Size - 2 - ACCMP Arch culverts (20' x 7.5')

Hw_{max} - 11.3 feet

Entrance condition - Headwall

$Hw/D = 11.3/7.5 = 1.51$

$Q_{max} = 1,600$ cfs (for one arch)

For two arches → $Q_{max} = (1600)\,2 = 3,200$ cfs

BLOWOFF CAPACITY: (Water Level at top of dam El 278.5)

Data: 1) 18" RCP
2) Outlet & Inlet Elevation assumed the same (El 270.7)
3) Sluice gate at inlet.
4) Length is equal to 35 feet
5) Assume an $f \cong 0.036$
6) Head loss due to gate = $0.25\,V^2/2g$

$$z_1 + \frac{P_1}{\gamma} + \frac{V_1^2}{2g} = z_2 + \frac{P_2}{\gamma} + \frac{V_2^2}{2g} + H_{L1-2}$$

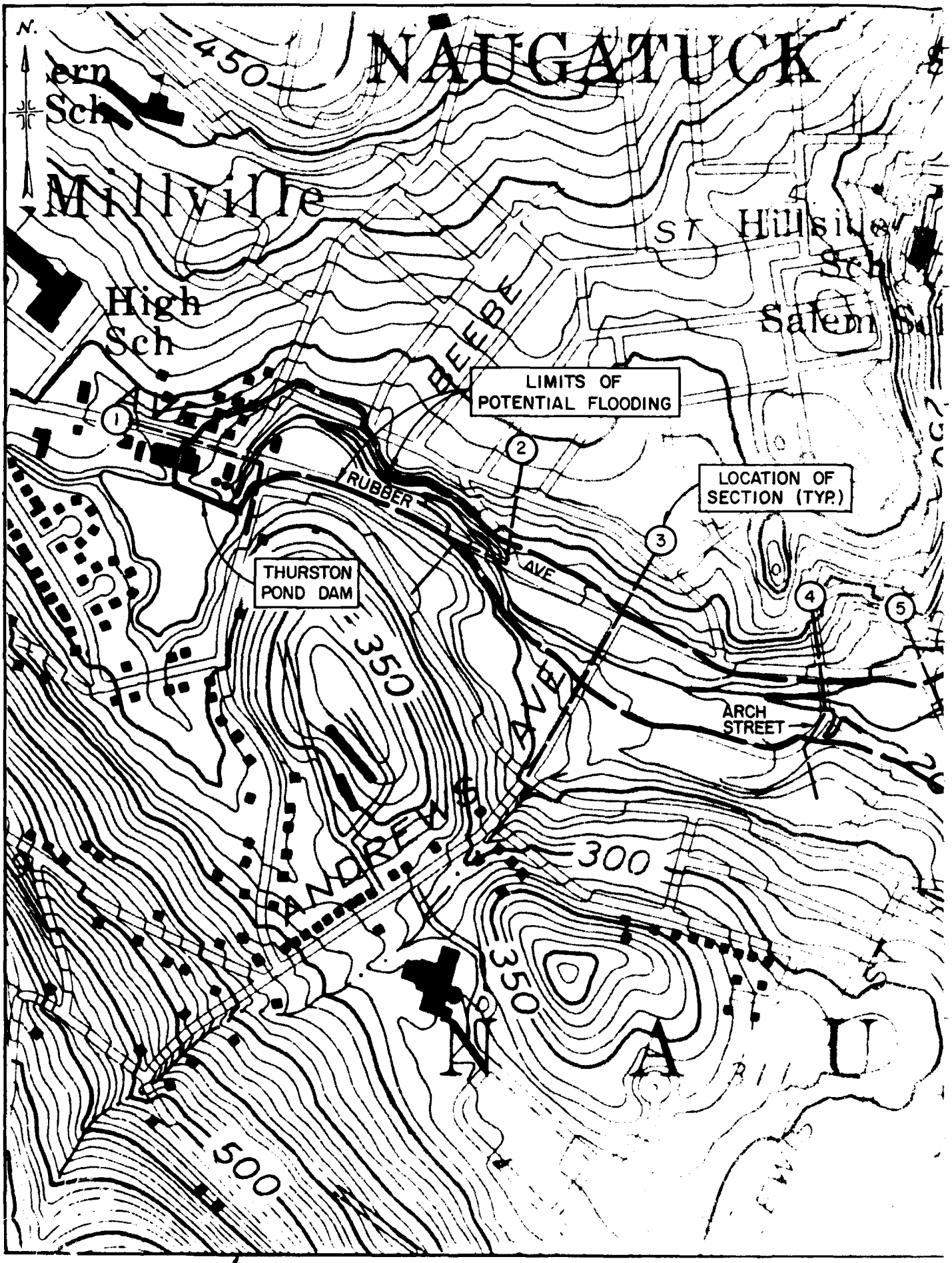
$$7.8' + 0 + 0 = 0 + 0 + \frac{V_2^2}{2g} + \left(0.036\left(\frac{35}{1.5}\right) + 0.25\right)\frac{V_2^2}{2g}$$

$$7.8' = 2.09\ V_2^2/2g$$

$$\therefore V_2 = 15.5\ ft/sec$$

$$Q_{AT\ TOP\ OF\ DAM} = VA = 15.5\ ft/sec \times \pi(1.5)^2/4$$

$$= 27.4 \text{ use } 27 \text{ cfs}$$


N.
NAUGATUCK
450
ern
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Millville
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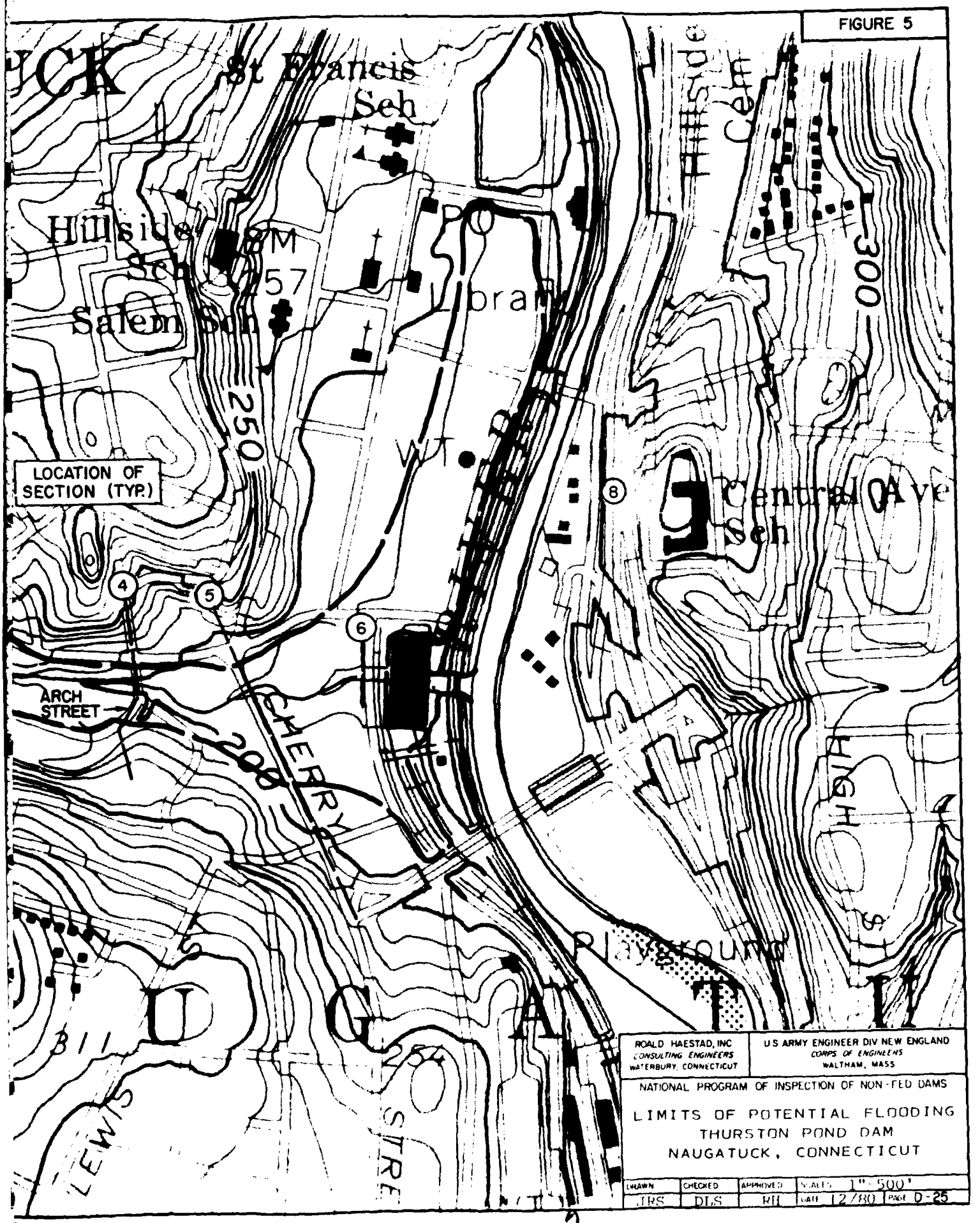
Salem
BEEBE
LIMITS OF
POTENTIAL FLOODING
LOCATION OF
SECTION (TYP.)
RUBBER
AVE
THURSTON
POND DAM
350
300
350
500
ANDREW
HILL
ARCH
STREET
1
2
3
4
5

FIGURE 5



ROALD HAESTAD, INC CONSULTING ENGINEERS WATERBURY, CONNECTICUT	U.S. ARMY ENGINEER DIV NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS

NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS

LIMITS OF POTENTIAL FLOODING
THURSTON POND DAM
NAUGATUCK, CONNECTICUT

DRAWN	CHECKED	APPROVED	SCALE 1" = 500'
JRS	DLS	RH	DATE 12/80 PAGE D-25

SUBJECT THURSTON POND DAM - Surface Areas

Planimeter Readings: (Scale 1" = 2000') #60272

Water Surface (El. 275): Third = 31.22 sq in 0.04
First = 31.14 sq in 0.04
Start = 31.10 sq in

$$0.04\ in^2 \times \frac{(2000\ ft)^2}{in^2} \times \frac{1\ acre}{43{,}560\ ft^2} = 3.67\ Acres$$

Contour 280: Third = 31.00 sq in 0.07
First = 30.85 sq in 0.07
Start = 30.78 sq in

$$0.07\ in^2 \times \frac{(2000\ ft)^2}{in^2} \times \frac{1\ acre}{43{,}560\ ft^2} = 6.43\ Acres$$

Contour 290: Third = 31.63 sq in 0.12
First = 31.39 sq in 0.13
Start = 31.26 sq in

$$0.12\ in^2 \times \frac{(2000\ ft)^2}{in^2} \times \frac{1\ acre}{43{,}560\ ft^2} = 11.0\ Acres$$

WATERSHED: # 70203

A) Above Long Meadow Pond: Third = 39.64 5.35 x 4 = 21.4
First = 28.94 5.34 sq in
Start = 23.60

$$21.4\ in^2 \times \frac{(2000\ ft)^2}{in^2} \times \frac{1\ acre}{43{,}560\ ft^2} = 1965\ Acres$$

B) Below Long Meadow Pond: Third = 38.10 8.29 x 4 = 33.16
First = 21.52 8.29 sq in
Start = 13.23

$$33.16\ in^2 \times \frac{(2000\ ft)^2}{in^2} \times \frac{1\ acre}{43{,}560\ ft^2} = 3{,}045\ Acres$$

Total Watershed = 1,965 Ac. + 3,045 Ac. = 5,010 Acres
= 7.83 sq mi

Note: The multiplication factor of 4, in the watershed calculations, is a planimeter constant for 70203.

APPENDIX E

INFORMATION AS CONTAINED IN

THE NATIONAL INVENTORY OF DAMS

INVENTORY OF DAMS IN THE UNITED STATES

STATE	IDENTITY NUMBER	DIVISION	STATE	COUNTY	CONGR DIST.	STATE	COUNTY	CONGR DIST.	NAME	LATITUDE (NORTH)	LONGITUDE (WEST)	REPORT DATE DAY	MO	YR
CT	129	NED	CT	009	05				THURSTON POND DAM	41 38.3	73 04.2	14	DEC	80

POPULAR NAME	NAME OF IMPOUNDMENT
NEW DAM	THURSTON POND

REGION	BASIN	RIVER OR STREAM	NEAREST DOWNSTREAM CITY-TOWN-VILLAGE	DIST FROM DAM (MI.)	POPULATION
01	0	LONG MEADOW POND BROOK	NAUGATUCK	1.0	23600

TYPE OF DAM	YEAR COMPLETED	PURPOSES	STRUCTURAL HEIGHT (FT.)	HYDRAULIC HEIGHT (FT.)	IMPOUNDING CAPACITIES MAXIMUM (ACRE-FT.)	IMPOUNDING CAPACITIES NORMAL (ACRE-FT.)
REPG	1890	0	20	20	65	29

DIST	OWN	FED R	PRV/FED	SCS A	VER/DATE
NED	N	N	N	N	

REMARKS
22 ESTIMATE 23 INDUSTRIAL WATER SUPPLY

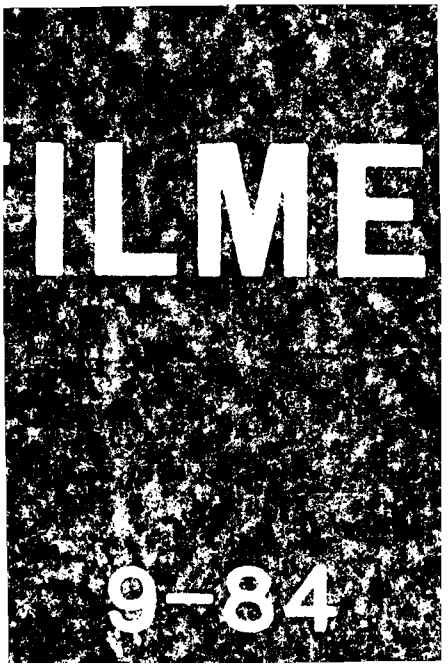
D/S HAS	SPILLWAY CREST LENGTH	SPILLWAY TYPE	SPILLWAY WIDTH (FT.)	MAXIMUM DISCHARGE (FT.)	VOLUME OF DAM (CY)	POWER CAPACITY INSTALLED (MW)	POWER CAPACITY PROPOSED (MW)	NAVIGATION LOCKS NO	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)
1	510	U	122	2400	1200											

OWNER	ENGINEERING BY	CONSTRUCTION BY
UNIROYAL INC	UNKNOWN	UNKNOWN

REGULATORY AGENCY			
DESIGN	CONSTRUCTION	OPERATION	MAINTENANCE
NONE	NONE	CT DEP	CT DEP

INSPECTION BY	INSPECTION DATE DAY | MO | YR	AUTHORITY FOR INSPECTION
ROALD HAESTAD INC	14OCT80	PL 92-367

REMARKS
34 EARTH 600CY STONE MASONRY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